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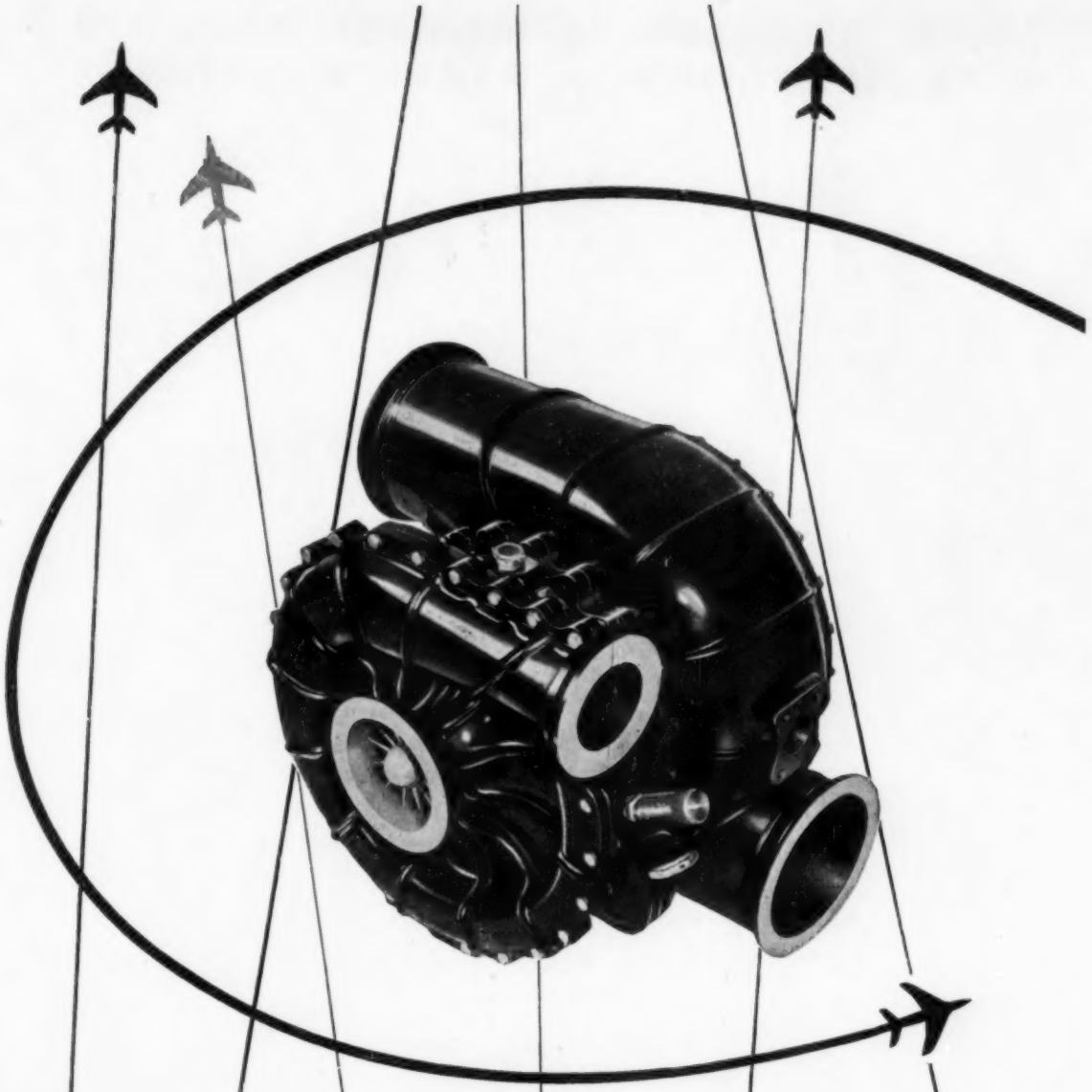

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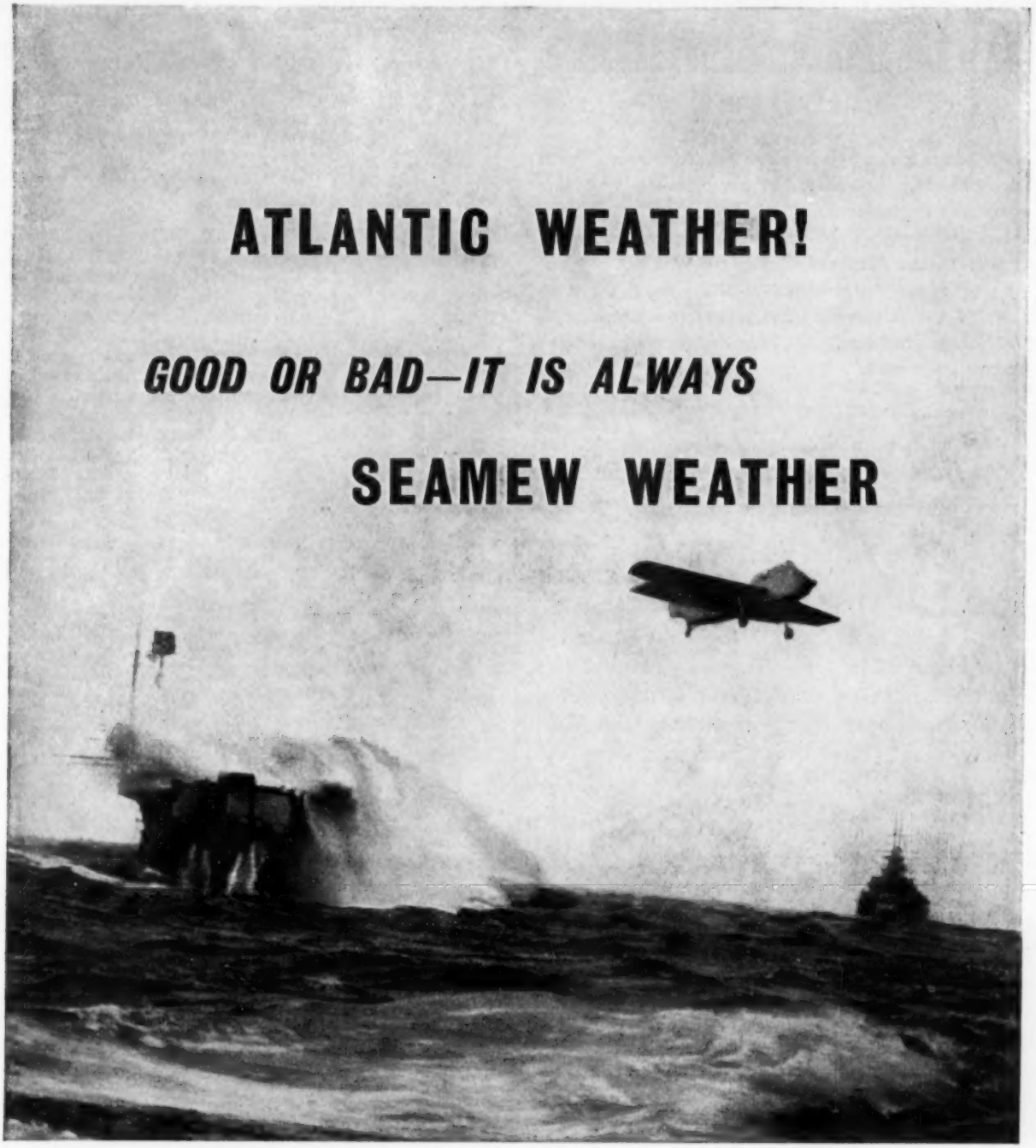


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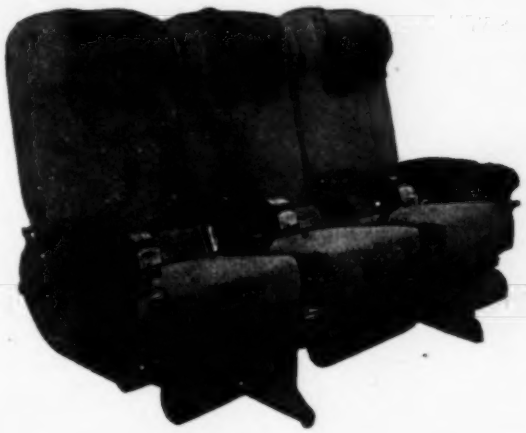

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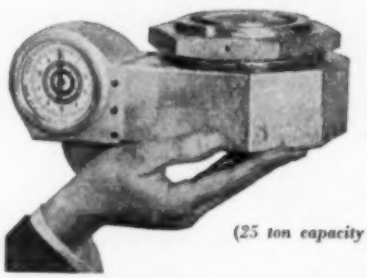

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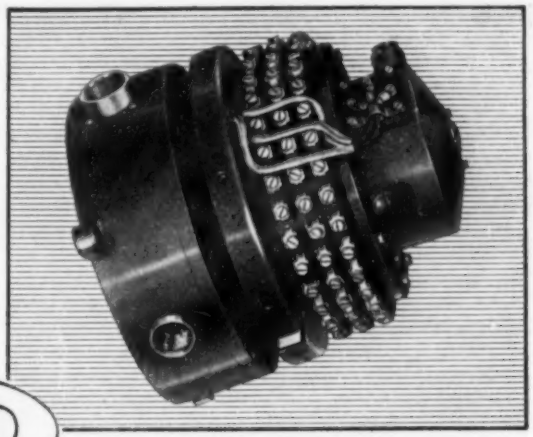

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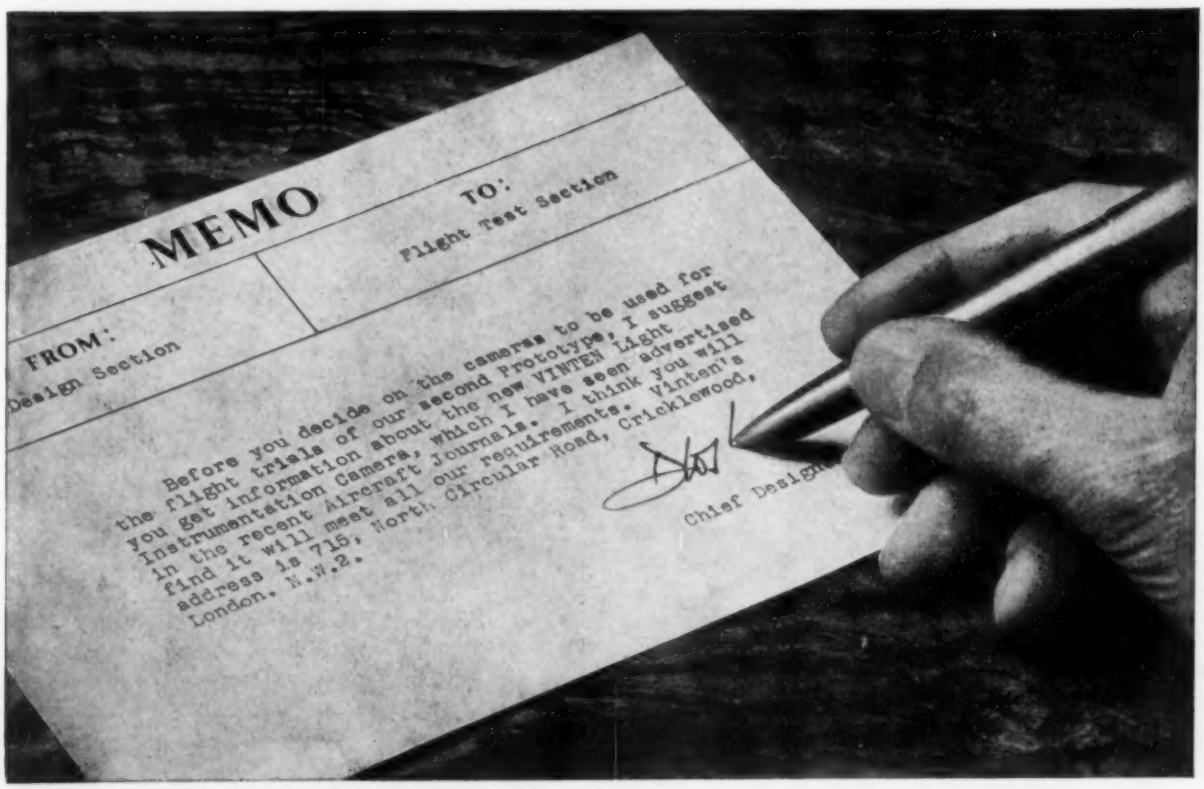
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FROM:
Design Section
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## Fair Stands the Wind for France

THE latest evidence that France's aircraft industry is waking-up its ideas (and—perhaps more important—also pulling up its socks) is the "In the Air" appraisal on pp. 401-406 of this issue. From its aggressive nose to its saucy butterfly tail the little twin-jet Fouga trainer there dissected is thoroughly and absolutely French. It combines the appeal of Simone Simon with the challenge of Sartre; and it is one of many designs which are indicative of France's very real technical progress. A second—even bolder in concept—is the courageous, and demonstrably efficient, Hurel-Dubois, intended as a Dakota replacement and likewise featured on a succeeding page.

No longer is France's aeronautical scene a morass of nascent and decaying prototypes. Brisk production of practical aircraft is geared to vigorous technical development, and the results command attention and acknowledgment. It is only a few days since we in Britain learned, with some discomposure, that a French fighter had gone supersonic in level flight—a feat never yet accomplished by any of our own designs; and the fact that the machine concerned, a Marcel Dassault Mystère IVB, was powered with a Rolls-Royce Avon was not wholly consoling.

The Mystère IVB, we may note, is one of a family of Dassault fighters which are winning good opinions among all who fly them, and which may even be mentioned in the same breath as our own Hunter and Swift; and although it was a British Avon which first propelled the Mystère supersonically on the level, it was a French liquid rocket motor which had earlier enabled the ageing, and once-derided, S.O. Espadon to achieve a similar distinction.

## Vitality

Another fast French machine meriting comment is the twin-jet S.O.4050 Vautour, adopted in several versions by the French Air Force. In this uncommonly adaptable vehicle France's Air Minister, M. Louis Christiaens, experienced the *franchissement du mur du son* at the age of 63. Then there are the S.O.9000 Trident, a straight-wing, turbojet-*cum*-rocket research aircraft designed for very high Mach numbers in level flight; the SFECMAS Gerfaut delta-wing intercepter—first of a number of new and unorthodox fighters; and the trolley-launched S.E.5000 Baroudeur fighter/bomber, designed for small-field operation and soon to be matched for NATO orders against an Avro delta and the Folland Gnat.

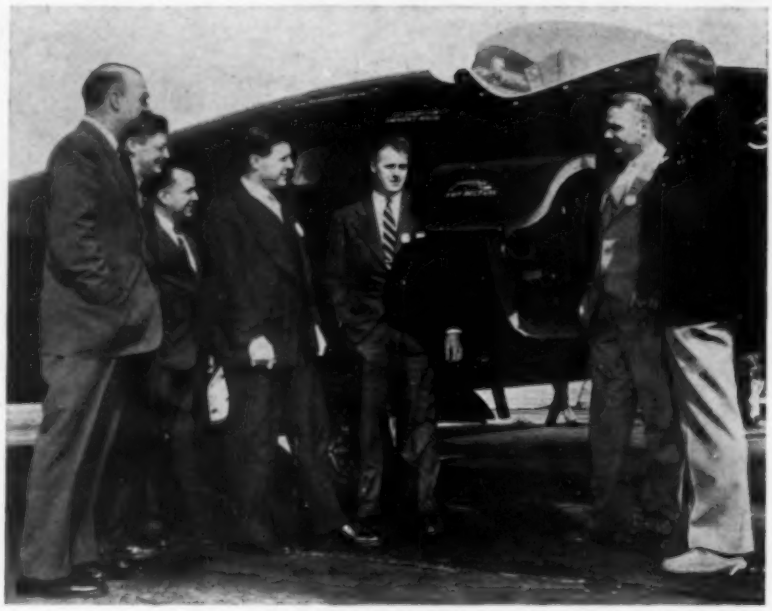
In the light-jet-trainer class the Fouga is not alone. Having an equal appeal in many respects (and side-by-side seats into the bargain) is that well-favoured scion of a long and illustrious line, the Morane Fleuret. In a modest way Sipa are pressing ahead with the Minijet, which, though it would hardly look out of place on a watch-chain, appears to have possibilities, if not as a trainer, then as a fast communication machine. As the "com." aircraft *de luxe* (Proctor-equipped R.A.F. units please note!) Morane are building a new four-seater, using Fleuret main components.

It would be invidious to exclude, even from this brief appraisal, the Noratlas—a serviceable, Packet-style, twin-boom transport with licence-built Bristol Hercules engines, and—now firmly established in commercial service—Breguet's double-deck Provence, which gave a good account of itself when it came to England last year. Nor must we overlook a pair of significant helicopters—the S.O. Farfadet "gyrodyne," with a nose-mounted turboprop and a jet-driven rotor, and the tiny two-seater S.O. Djinn, the rotor of which is compressed-air driven.

As for new techniques, we need only cite the SNECMA system of thrust reversal, demonstrated to excellent effect at Le Bourget last year, and the sandwich construction of Sud-Ouest, extensively used in the Vautour. To France's credit, too, may be set down some notable metallurgical advances, including the extrusion of stainless steel; and as for light aircraft, she can show a profusion, ranging from indifferent to first-rate.

It will be our pleasant duty from time to time to report first-hand the further progress of a nation which has contributed such a wealth of ideas and achievements to the science of flight and which Sir Philip Sidney felicitously dubbed "that sweet enemy France."

*HOME FROM HOME: The caption to this Martin photograph, received as we go to press, reads: "Mr. Maurice Smith, editor of the British aviation magazine, 'Flight,' is shown (fourth from the left) looking over a U.S.A.F. B-57 during his visit to the Glenn L. Martin Company today. Mr. Smith, an R.A.F. pilot during World War II, recently flew the British Canberra and was very interested in the manufacturing techniques used in producing the B-57—the American version of the already famous Canberra. Pictured with Mr. Smith are: Mr. J. W. Sweetser, Vice-President Sales at Martin; Mr. Glen Hobday, English Electric representative at Martin; Mr. G. T. Willey, Vice-President Manufacturing at Martin; and Mr. C. H. Welling Jr., Mr. S. Furnam and Mr. W. R. Turner, all of the Martin Company."*



# FROM ALL QUARTERS

## The Aden Gun

IN the course of a tour of Vickers-Armstrongs' South Marston factory, where Swift fighters are in volume production for the R.A.F., Mr. Duncan Sandys, Minister of Supply, made official reference to the new cannon which arms the Swift and which is capable, he said, of inflicting "devastating" damage. He named the cannon as the 30 mm Aden, adding that it has been designed by the Ministry of Supply Armament Development Establishment. "With this powerful cannon," he went on, "the Swift is capable of bringing to bear against an enemy aircraft eight times more high explosive than was possible with earlier types of guns. Its revolutionary design gives the Aden cannon about twice the rate of fire of the 20 mm Hispano gun, which has been our standard fighter weapon since 1941. Trials have proved that the Aden, with its advanced type of gun-sights and quick-acting fuse, is capable of inflicting devastating damage. The introduction of the Swift, with its superb flying performance and terrific fire power, is a milestone in the progress of Britain's air defence."

The Aden is named after the initials of the establishment responsible for its design, i.e., "Armament Development Establishment, Enfield," and is being produced in the first place in the Ministry of Supply's Royal Ordnance Factories and by the B.S.A. Company.

The Minister flew to South Marston from London by helicopter. Of Swift output he said, "The Swift is now in regular flow production and the rate of deliveries to the R.A.F. will be built up steadily during the coming months."

During recent weeks Mr. Sandys has devoted a great deal of time to visiting the industry. Shortly before his South Marston tour he had been to Kingston-on-Thames to see Hawker Hunter production. Shown round the works by Mr. Neville Spriggs (managing director), Sir Sydney Camm (chief designer and director) and Mr. J. T. Lidbury (general manager), he said he was "greatly impressed" by the progress being made. "The R.A.F. can expect to receive substantial deliveries over the next few months," he said.

On April 9th the Minister is to fly to Canada for a three-week tour of factories and Service establishments.

## The Canadian Britannias

ON Wednesday of last week the Bristol Aeroplane Co., Ltd., announced formal completion of the Canadian Britannia contract. Their statement was in the following terms:—

"The Bristol Aeroplane Company takes pleasure in announcing that the agreement between the Canadian Government and the Company covering the manufacture of military versions of the Bristol Britannia in Canada has now been formally concluded in Ottawa. The necessary design modifications for the military rôle and the work of construction will be undertaken by Canadair, Ltd., of Montreal, with the Bristol Aeroplane Company's technical collaboration.

"Maritime reconnaissance demands low fuel-consumption at low altitude and the maritime Britannias will therefore be powered by compound piston engines in place of the Proteus turboprops which are designed to provide their best economy at the relatively higher altitudes at which the transport Britannias will operate."

## H.D.31 at Shoreham

ON Friday last the prototype H.D.31 visited Shoreham airport, Sussex, for demonstration before members of the British airline industry. This remarkable French aircraft spent the day making a series of flights, taking off each time with a full load of passengers in less than 300 yd, and landing in less than 150 yd. The grass surface of the field was fairly soft after a wet night, and the H.D.31 took off each time at its maximum weight of 13,000 kg (28,600 lb) against a light wind. It was originally intended to demonstrate one of the H.D.32 prototypes, but the necessary documentation could not be completed in time. As mentioned in

*INTO THE PICTURE flies a new shape in British gliding—Hugh Kendall's K.1, now undergoing initial flight tests at Lasham (see news item on the opposite page). In the cockpit picture is Hugh Kendall, the designer, who is at present carrying out the tests; he is seen before an aero-tow launch.*

"Flight" photographs

*NO GORGEOUS GUSSIE, but almost able to operate from a tennis court, the H.D.31 is shown airborne with a full load of passengers near Shoreham during its visit to this country, described in an accompanying news-item.* "Flight" photograph

*Flight* of March 19th, 32 of these aircraft have been ordered by three French operators.

The H.D.31 was piloted by Max Fischl, test pilot of the H.D.32, who has also carried out some of the test flights of the Sipa 200 Minijet. He was accompanied by a crew of five. Also at Shoreham were M. Hurel and the company's technical director, M. Maxime Robin, who was largely responsible for the design of the H.D. series.

Considerable interest was shown in the aircraft by the numerous representatives of the British independent air transport companies who had been invited to the demonstration by F. G. Miles, Ltd. Despite the somewhat outlandish appearance of the high-aspect-ratio, braced wing and fixed tricycle undercarriage, those present could have been left in little doubt of the aircraft's capabilities. The state of the airfield surface on Friday, and the proximity of a hill on the take-off path, would have precluded Dakota operations; yet the H.D.31 operated all day from a small corner of the airfield with a load equivalent to that of the Dakota.

The H.D.31 is, of course, a prototype, and therefore not soundproofed; and the presence of a large instrument panel and desk, a number of parachutes and other equipment did not allow the full number of passenger seats to be fitted. We noticed that one spare wheel was being carried, and learned that, in the event of both mainwheels on one side becoming unserviceable, the aircraft could take off with the single spare wheel fitted in their place. Both nose- and main-wheels are the same size.

The visit of the H.D.31 to Shoreham may be explained by a statement issued by F. G. Miles, Ltd., to the effect that "discussions have been initiated with a view to technical collaboration between F. G. Miles, Ltd., and Avions Hurel-Dubois in connection with the possible construction of a number of H.D.32 aircraft."

## Dunstable Dinner

THE pioneer days of British gliding were recalled at Dunstable last Saturday, on the occasion of the annual dinner of the London Gliding Club, when the guest of honour was Mr. Siebert Humphries, one of the club's earliest members. Proposing the health of the guests, Mr. Godfrey Lee referred also to the representatives of other gliding clubs, the golf club on the top of the ridge, and the Sporting Owner-Drivers' Club (who frequently operate at Dunstable). Also present, he pointed out, was the superintendent of Whipsnade Zoo, where club pilots and the animals were inclined to frighten each other.

Replying for the guests, and proposing the health of the club, Mr. Siebert Humphries left no doubt in the minds of those present that gliding in the early days "was damned good fun." It had much in common with the pioneering efforts on powered aircraft in 1909-1912 when, allegedly, one never ventured outside the airfield because of creditors; and when, after rushing at full throttle across the field in the morning dew, it was by walking back to see if there were any gaps in the wheel-tracks that one determined whether a flight had been made.

The excellent performance of the London club's pilots in last year's national contests was recalled by Mr. Dan Smith (chairman), who spoke next. The result was seen in the impressive trophies on show that evening: the Kemsley Cup (Lee and Ellis); the Londonderry Trophy, Firth-Vickers Trophy and Manio Cup (Geoffrey Stephenson); and the Douglas Trophy (Lee, Ellis and Stephenson). During the evening, a miniature Olympia sailplane was presented to Mr. Dudley Hiscox, chairman of the club for 13 years, "in affectionate recognition of all he has done for the London Gliding Club." The presentation was made by Mrs. Smith, who herself received a bouquet from the club; and a second bouquet was presented to Mrs. Turvey, who has looked after the catering at Dunstable for some 25 years.

## The K.1 At Lasham

AS reported last week, the K.1 sailplane in which Philip Wills is to compete in this year's world gliding championships is at present being test-flown at Lasham. A brief visit last Sunday enabled *Flight* to obtain a glimpse of this most interesting machine which, it may be recalled, was previously intended to be fitted with Durestos wings of Miles manufacture. Photographs appear on the opposite page.

The Miles-built fuselage is of wooden construction, as are the wings now fitted. These have been made by Elliotts of Newbury and are noteworthy both for the excellent surface-finish which has been achieved and for the full-span ailerons which are fitted. Small skids are attached to the blunt wing tips.

In addition to the mainwheel and skid, a small tailwheel is fitted to the K.1. The side-by-side two-seat cockpit is roomy, and the pilots' view (both forward and rearward) appears much better than from any other British sailplane. The most interesting feature of the machine is, of course, its vee-tail (which carries mass-balance tubes) and associated controls; the experience gained on this type of machine should prove extremely valuable in the development of future British types.


### THE WORLD'S AERO ENGINES

NEXT Friday's issue of *Flight*, dated April 9th, will be the special "Power Units of the World" number. It will contain two major features which we believe to be unique of their kind. One will be a detailed description of current methods by which new engines are evolved, designed and developed to the flight-test stage; its treatment will be such that it will appeal both to the technician and to the reader whose interest is less professional, and it will be illustrated by particularly striking photographs.

The second special feature will be a comprehensive review of the world's leading engine-manufacturing firms and their products, together with notes on components, accessories and materials. Illustrated by some 80 general-arrangement side-elevations, it will form an immensely valuable work of reference.

The demand for this greatly enlarged special issue—which will also contain general news and regular features—is certain to be heavy; we suggest that readers should place advance orders with their newsagents if they have not already done so.

*AIR-RACING SPECIAL: Displayed on the apron at Shoreham last week, the Miles Sparrowjet is at the moment powerless. The engines were expected back at the end of the week, after modification at the Turboméca factory in France.*

"Flight" photograph

## FROM ALL QUARTERS . . .

### New Test Pilot for Airwork

THE appointment is announced of S/L. J. P. Tyszko, M.C., A.F.C., as chief test pilot to Airwork, Ltd. He succeeds Claude Trusk, who was the company's test pilot for many years, and who died after an illness last August. "Joe" Tyszko served with the Polish Air Force from 1938 and came to the United Kingdom in 1940, when he served with No. 301 (Polish) Bomber Sqn. From 1942 he was with No. 24 Commonwealth Sqn., engaged in V.I.P. communication duties. In 1951 he completed No. 10 E.T.P.S. course at Farnborough and since then has been test-flying bombers at the A. and A.E.E., Boscombe Down. Among the more recent of the many aircraft types that figure in his log-book are the Canberra, Vulcan and Victor.

*S/L. Tyszko.*

### Sir Nelson Johnson

WE learn with regret of the death, in hospital on March 23rd, of Sir Nelson Johnson, K.C.B., D.Sc., A.R.C.S., who was Director of the Meteorological Office, Air Ministry, from 1938 until last autumn. He was 61 years of age.

Before the First World War Nelson King Johnson was assistant to Sir Norman Lockyer at the Hill Observatory, Sidmouth, and in 1915 he joined the Royal Flying Corps, serving as a pilot until 1919. During this period he suffered a serious crash as a result of a flight in bad visibility, and it was said that this caused him to devote much of his ability, from that time onwards, to the study of weather phenomena in particular relation to flying.

After the war he joined the Meteorological Office, and was there until 1928, when he was seconded to the War Office for duty at the Chemical Defence Research Establishment, Porton, of which he subsequently became chief superintendent. In 1938, on the retirement of Sir George Simpson as Director of the Meteorological Office, he was appointed to the post.

No one whose duties in the Second World War brought them into contact with his organization can fail to recall the efficiency with which he performed diverse and arduous duties. It would be no exaggeration to say that during the war period the lives of thousands in the flying Services depended on the efficiency of the forecasts for which his department was responsible. The culminating achievement in this work was undoubtedly the accurate forecasting of the weather for the Normandy invasion.

From 1946 to 1951 Sir Nelson Johnson was president of the International Meteorological Committee, and in 1951 he was elected president of the World Meteorological Association. He leaves a widow and a son and daughter.

### Dowty Reorganization

ANNOUNCEMENT was made last week, by Mr. George Dowty, of an important reorganization in the group of ten companies, here and abroad, which he controls. Dowty Equipment, Ltd., are to form a new holding company, to be known as Dowty Group, Ltd., and it is intended to offer shareholders three fully-paid 10s shares for each 5s share held in the existing parent company. A further issue is likely to be made on completion of the scheme.

It is believed that the new arrangement will further enhance the group's efficiency, and plans for two new factories are in hand.

When trading results for last year are disclosed, it is believed, the group will show a profit of over £1m; in 1945 the figure was £33,000. A dividend of 33 per cent, tax-free, as against 22 per cent last year, has already been announced. Five thousand of the group's employees are to receive a £12 bonus.

## ROYAL AERO CLUB A.G.M.

A YEAR of successful and varied activities was reviewed by Mr. S. Kenneth Davies (chairman of the Royal Aero Club) in his report for 1953 at the club's annual general meeting on March 24th. Among the year's major events had been the England to New Zealand air race, the celebrations marking the 50th anniversary of powered flight, and the establishment by British pilots of a total of 30 world records. Of these records, he continued, four principal ones deserved special mention; these were the world altitude record by W/C. W. F. Gibb (63,668ft), the world speed records over the 3-km straight course and 100-km closed circuit by S/L. Neville Duke (727.6 and 709.2 m.p.h. respectively), and the world speed record over the 3-km course by Lt. Cdr. M. J. Lithgow (735.7 m.p.h.).

The club's membership now comprised 1,539 full members, 414 overseas members and 1,921 associate members. Of the 112 new members who had joined that year, 35 had entered under the special arrangement applying to those below 25 years of age. There was an overall surplus for the year of just under £400.

After referring to the R.Ae.C. Aviation Centre at Londonderry House and describing the activities of the various organizations there, the chairman gave an account of the good work performed by the Kemsley Flying Trust. "The Trust made available the prize money for the design competition and was implicated with the finances of the successful National Air Races of 1953," Mr. Davis said. "While interest in the light aeroplane clubs remains at a low level," he continued, "the trustees are not able to do as much as they would like to help towards an extension of the flying club movement. On the other hand, the growing interest in gliding has called for a great deal of assistance from the fund, which has been readily afforded and produced most excellent and encouraging results. Because the Trust will guarantee the initial expenditure relating to the organization of the world championships in gliding, the British Gliding Association was able to make an acceptable offer to hold the contests in England in 1954, an occasion which must add to the prestige of the United Kingdom in sporting flying."

For 1954, the major events in sporting flying would be the world gliding championships, the national air races and the national air touring competition. It was hoped that the Alcock and Brown memorial at London Airport would be unveiled about the middle of the year, and in September the club was organizing an international air rally to repay some of the hospitality received from the flying clubs of other countries.

Nine vacancies on the club committee, Col. R. L. Preston (secretary-general) then announced, had been filled by: Lt. Col. C. F. H. Gough, Eric S. Greenwood, Capt. A. G. Lamplugh, Major R. H. Mayo, G/C. C. S. Morice, Major R. E. Nicoll, Major H. A. Petre, Major J. Stewart, and Lawrence Swan. On the recommendation of the committee, the president of the club, Lord Brabazon of Tara, was re-elected for another year, as were the vice-presidents (Capt. Sir Geoffrey de Havilland, Lord Gorell, Sir Francis K. McClean, Sir Frederick Handley Page, Whitney W. Straight, and the Duke of Sutherland) with the addition of Viscount Kemsley of Dropmore.

*Lord Brabazon presents an R.Ae.C. Silver Medal to W/C. R. H. McIntosh, chief pilot of Airwork, Ltd., and C.O. of No. 522 R.Aux.A.F. Transport Sqn.*

Following the meeting, Lord Brabazon presented the club's Silver Medal to W/C. R. H. McIntosh, D.F.C., A.F.C., for his services to British aviation over a period of 34 years. Lord Brabazon referred to W/C. McIntosh's impressive record dating from R.F.C. days and which involved both British commercial aviation and air racing. His total of flying hours was 23,000 and he had flown 111 different types of aircraft.

*Sampling the Zero Reader and other Instruments in the Sperry Company's Anson*

*The pilots' panel of the Sperry Anson is straightforward and neat in appearance, despite the variety of instrument types it contains. The blind panels are the new B.O.A.C. type and the Zero Reader controls are placed centrally above the engine instruments.*

# I.F.R. WITHOUT TEARS

A SPECIAL Anson XIX is kept at Cranfield by the Sperry Gyroscope Co., Ltd., for use in testing and demonstrating their range of flight instruments. This range has in the past year been considerably extended, principally to meet the changing requirements of modern aircraft, both civil and military, and to keep abreast of these developments, two representatives of *Flight* recently sought permission to fly Sperry's Anson with a view to observing the results at first hand.

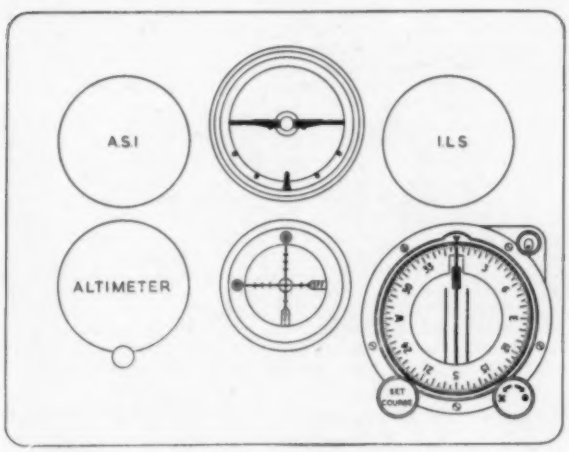
Although the instrument panel of the average airliner, bomber or fighter has altered comparatively little in appearance, considerable changes have been wrought in the "works" behind the panel. For instance, increasing use is now made of electrically driven gyros for high-flying or highly manœuvrable aircraft. The object of this is to provide higher rotational speeds, to overcome the difficulty of obtaining sufficient air to drive a gyro at high altitudes and to allow the horizon gyro increased freedom within its gimbals. For civil aircraft particular emphasis is now laid on instrumentation which will as far as possible facilitate blind approaches. B.O.A.C., for instance, have chosen a new basic six-instrument blind panel for their new aircraft (particularly the Comet) and this has been installed and tested in the Sperry Anson.

Perhaps the best idea of the significance of such developments can be given by a straightforward description of the new equipment installed in the Anson. We spent altogether two hours in the air trying out all the "gadgetry" and, besides being considerably impressed by its efficiency, we had ourselves (as the saying goes) a whale of a time.

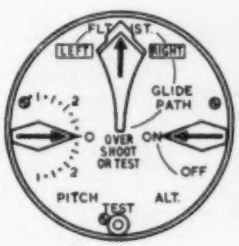
**The Zero Reader.** The most striking item was the Zero Reader flight director. This is a remarkable instrument, and although it was described in some detail in an article in *Flight* of August 18th, 1949, we have no hesitation in describing it again. First, a number of modifications have been incorporated and, secondly, the principle of the instrument is initially difficult to grasp by those accustomed to the standard type of instrument indication. Basically, the Zero Reader is a cross-pointer instrument of quite small diameter which accepts and co-ordinates information from a number of sources. This information it resolves into instructions to the pilot, who has only to maintain the two needles of the cross-pointer in the central position in order to perform the manœuvre he has at any point selected. Flight guidance is obtained by adjusting the three switches on the control panel and setting the course selector, illustrated at the foot of this column.

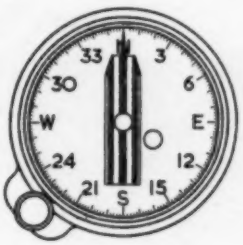
Take first the simplest condition, the maintenance of a straight and level flight-path. The upper switch on the panel is set to "flight instrument" and the pitch control to zero. The tramline pointer on the course selector is then set with the knob at lower left of the dial to the required heading. If the tramlines are set to 270 deg and the aircraft is heading 300 deg, the vertical needle of the Zero Reader will move to the left. The pilot applies left bank until the needle moves back to central. By keeping it central he will maintain a correct and reasonable angle of bank.

As soon as the aircraft begins to close the desired heading the Zero Reader vertical needle will move gently to the right, and the pilot will follow it by taking off bank. When the needle has again settled on the centre the pilot will find himself flying straight on 270 deg. At a chosen height he can then switch the height lock, marked "ALT." on the panel, to "ON." The horizontal needle of the Zero Reader will then give him height and pitch attitude directions to supplement the heading directions of the vertical needle. If he is low the needle will swing up, and by pulling back on the stick he will bring it back to zero. As he reaches the correct height the needle will tell him to push




*The new B.O.A.C. blind panel (left) with C.L.2 Gyrosyn repeater and Zero Reader at lower right and centre. (Below) The Zero Reader control panel and course selector referred to in the text.*



## I.F.R. WITHOUT TEARS . . .

the stick progressively forward to regain level flight attitude as he reaches the correct height.

Thus it can be seen that with only two pointers the Zero Reader will give complete and easily followed instructions for pitch, roll and yaw. A turn on to a new heading can be carried out by resetting the tramlines to the new heading and following the instructions of the instrument. The application and taking off of bank, and the amount of bank to be applied, will be dictated by the vertical needle and there is no need to anticipate it as one must with standard instruments.

In like manner a climb or descent of anything up to 10 deg can be selected on the pitch control at the left of the Reader's control dial. The only limitation so far is that a turn of more than 165 deg must be completed in two stages, i.e., by setting the course selector first to an intermediate heading and then to the final heading.

It is possible to take off with the aid of the Zero Reader, simply by setting the runway QDM on the course selector and on the panel, setting the top switch to "FLIGHT INSTRUMENT" and selecting a suitable angle of climb in degrees on the pitch control. The vertical pointer only is used until climbing speed is gained and the pilot zeros the pointers and climbs away. It is literally as simple as that.

A great variety of standard manœuvres can be selected and flown on a Zero Reader by the use of the controls described above.

In the air near Cranfield we found it delightfully simple and accurate. We had the great relief (and it must be even greater for a tired pilot) of knowing that, whatever the attitude of the aircraft, so long as the two needles were central we were doing what we had intended. We had not previously flown an Anson, but the Zero Reader made it seem like a familiar aircraft. In fact, it would be shooting no line to say that it was quite as easy to fly on the Reader as by the normal external visual references.

We come now, however, to a function which may seem to be the Zero Reader's party trick, but which is in fact one of its normal duties. It guides even an uninitiated pilot through an I.L.S. approach so that his aircraft is accurately positioned for a landing in bad weather even though his experience of I.L.S. is extremely limited.

We describe an "outbound" as opposed to an "inbound" procedure in order to illustrate all the positions on the Zero Reader selector switch. The first step is to home on the airfield and to arrive overhead at the height required for the initial stages of the landing pattern. The aircraft is then turned on to a reciprocal bearing of the I.L.S. runway (QDR). The Zero Reader height lock is engaged and the course selector set to the QDR. On such a heading the normal I.L.S. azimuth needle would give reverse indications, since it senses the blue and yellow sides of the beam regardless of the aircraft heading. The Zero Reader, however, is set to "LEFT." This ensures that correct signals are fed to the Zero Reader and, so long as the needles are correctly crossed, the aircraft is either closing the beam outbound or is on it.

During this leg, drift due to cross-wind can be assessed in the normal manner and compensated by offsetting the course selector. The amount of drift is noted for future reference.

At a predetermined point after passing the outer marker (flashing green light next to the I.L.S. indicator) the course selector is turned 45 deg right and the aircraft flown for the required time on the first leg of the procedure turn. The Zero Reader is switched to "FLIGHT INSTRUMENT." A 180-deg turn to port or starboard is then accomplished in two stages with the course selector, and flaps and undercarriage lowered for landing. As the beam is closed the Zero Reader is reset to "RIGHT" to give the correct azimuthal directions for the QDM. With the height lock still engaged the Reader "zeros" on the beam and the course selector is set to the QDM corrected for wind drift.

During our trial there was a cross-wind of some 20 kt, but we had very little difficulty in settling on to the beam. We had previously tried an I.L.S. approach without Zero Reader, and although we had successfully completed the Service exercises on the aural T.B.A., we found it difficult in the bumpy conditions and with the strong cross-wind.

*The instruments fitted in the cabin of the Sperry Anson: Top row, second C.L.2 repeater, H.L.5 horizon gyro unit, C.L.2 master indicator; second row, H.L.8 air-driven horizon, gyro direction indicator, altimeter and A.S.I. Another A.S.I. is fitted below.*

When the horizontal needle of the I.L.S. indicator showed that we were intersecting the glide slope we switched the Zero Reader to "GLIDE PATH." This automatically disengaged the height lock and, with the required power adjustment, the Anson settled happily on to the glide path. With a blinding afternoon sun shining directly through the windscreen we kept heads well down and made a genuine instrument approach; and when we finally glanced over the nose at about 150ft we saw the runway stretched out before us, dead ahead and truly lined up.

There would have been no difficulty in making the landing, but we selected the instrument's last control position, marked "OVERSHOOT." This has been incorporated to allow a pilot to overshoot on the Zero Reader without having to readjust suddenly at low level to normal six-instrument blind flying. It works extremely well. He simply has to keep the needles truly crossed as before, apply power, and raise flaps and undercarriage at suitable altitude; and when next he looks over the side he will find himself climbing smoothly away. He can then reset the Reader for the next move.

This instrument is the obvious answer to fatigue in long I.F.R. flights. It is simple and accurate. Traces made by Sperry show that the smoothness of a flight-path held with a Zero Reader is very nearly the same as that held by an extremely accurate electronic autopilot. The human pilot using the Zero Reader becomes, in fact, the servo in an autopilot circuit.

The importance which the airline companies attach to the instrument is shown by the fact that on the new B.O.A.C. instrument panel the Zero Reader holds the central position. In fact, with the Reader, artificial horizon and gyro magnetic compass, the turn-and-bank indicator becomes a standby instrument; in Sperry's Anson the electric turn-and-bank indicator was provided outside the panel and at no time did we require to refer to it. The simplicity and accuracy of instrument flying with the Zero Reader enables the pilot to keep a constant monitoring check on all his other instruments.

**Gyro Magnetic Compass.** The G.4.F (fighters) and G.4.B (bombers) will already be familiar to most Service pilots. The instrument supplies on a vertical face a constant indication of actual magnetic heading. No longer need heading information be obtained from the constantly swinging liquid compass and fed into a constantly drifting gyro D.I. This compass is both magnetic and gyro-stabilized. In all reasonable aircraft attitudes it indicates actual heading. There is no noticeable swing or waver, and the face itself is large enough to permit accurate course-holding to within extremely small limits. It functions, moreover, in the "natural" sense; that is in a left turn the lubber line moves to the left round the dial, and *vice versa*. Being partially a gyro instrument it has, of course, limits (at plus or minus 85 deg in pitch or roll). It may subsequently take a long time to

*The Sperry Anson XIX, resplendent in blue finish, prickly with aerials and static-discharge wicks.*

re-align if left by itself—several hours for 180 deg. But this is immediately noticeable, and resetting is simplicity itself. The pilot merely presses the clearly marked button and turns it until the dot and cross in the annunciator window (two o'clock in the dial rim) alternate steadily. If for some reason the magnetic detector unit fails, the compass can be employed as a plain gyro D.I.

Sperry produce three versions of the instrument, the C.L.1 (and C.L.1A), the C.L.2 and the C.L.3. These correspond respectively to the Services' G.4.F, G.4.B, and G.4.F.T. The C.L.1 is a straightforward gyro-magnetic compass using magnets for deviation correction of the detector unit (usually located in the tail or wingtip), an amplifier and the indicator. The C.L.1A is similar, but utilizes an electro-magnetic compensation system, so that this can be carried out from the cockpit. The C.L.2, intended primarily for large aircraft, is the instrument specified for the B.O.A.C. panel. It has a detector unit, an amplifier and a master indicator located at the navigator's position, with a control panel. One or two gyro units almost identical in appearance with the C.L.1 are fitted in the pilots' panels. If required, local magnetic variation can be set in at the master indicator so that all indications will be in relation to true north. The C.L.3 is a combination of the C.L.1 and 2; it is intended for aircraft in which a navigator is not carried, but where variation control and azimuth monitoring of Air Position Indicator or radio compass are required. The compass dial in this case is identical with that of the C.L.1.

It can be said that a compass of the G.4.F type is now regarded as vital for jet aircraft where accurate and constant directional information must be provided, even during violent and prolonged manœuvring at high speed.

**Artificial Horizons.** Principally under the stimulus of jet-aircraft requirements, a great deal of development has gone into producing an artificial horizon which will provide accurate attitude-reference in almost any flight condition. Because of the rapidity with which the jet aircraft will lose height, flying on primary instruments is no longer to be contemplated except in emergencies. In a Meteor, for instance, it could prove fatal to lose control in cloud at less than 5,000ft above ground level, since that is the height required for recovery from a vertical dive. The best way to avoid losing control is to have a fully free artificial horizon. The Sperry Company has gone a very long way towards providing such an instrument.

Firstly, the gyro horizon must be electrically driven, because of the difficulty of obtaining an air drive at very high altitudes; secondly, it must be as free as possible.

A series of Sperry horizons has been produced, leading up to the H.L.6 and H.L.8. The H.L.6 is now in production, but the company's Anson was fitted with a prototype version in the first pilot's panel. Many present military aircraft have an early type of H.L.6 known in the Services as the Mark 3. This is fully free in roll and allows 85 deg of dive or climb. It does not topple, but only ceases to function for a short time. In practice it is possible to carry out all aerobatic manœuvres without losing the use of it for more than a fraction of a minute. The H.L.6 will have the same working limits as the Mark 3, but will embody three new features. First, the small "aircraft" in the centre of the dial will be in the form of an inverted gull wing; this has been found the most suitable reference to align with the horizon bar. Second, it will be fitted with a small flag at the top of the dial which will show "OFF" either when the instrument is switched off or if power fails. Third, and probably most important, it is provided with a fast-erection device. If the horizon is upset the pilot has merely to press a button (at the rim of the dial) marked "Fast Direction PUSH" to re-erect the instrument in level flight in the space of a few seconds. This device may also be used for initial erection before take-off.

The H.L.8 is an air-driven version of the H.L.6 with the same limits but without the "OFF" flag or fast-erection device. Both instruments have a roll cut-out which greatly reduces turn errors.

Sperry have, incidentally, produced a horizon—the H.L.4—specially for helicopters, but this, of course, was not fitted in their Anson. Basically the instrument is intended to give attitude information against a datum that is variable to allow for fuselage attitude.

In the co-pilot's position in the Anson the artificial horizon was, in fact, a horizon gyro unit Type B (H.L.5), an instrument required to provide attitude information for either an auto-pilot or the Zero Reader. The first pilot's artificial horizon is a separate instrument so that on his panel the Zero Reader and artificial horizon are completely independent to allow effective cross checking in flight.

**The Sperry Anson** is a remarkable aircraft; it is full of instruments, yet its passenger cabin has the opulent air of a V.I.P. machine and the cockpit is a model of what such places should be. It was, indeed, our first impression on sitting in the pilot's seat that the instrumentation was particularly well arranged. The B.O.A.C.-type blind-flying panels are a great improvement on previous layouts.

Fixed to the centre pillar of the windscreen is a radio compass which we used during I.L.S. approaches as a check on the markers. On the bulkhead behind the first pilot's seat there is an array of control panels used to check the extensive electrical system. Each instrument is individually selected by circuit-breakers on a special panel designed by Rotax. From this bulkhead rearwards, a series of shelves is fitted, on which are mounted all the various "black boxes." The compartment is open, well lit and easy to reach. On the bulkhead at the rear of this compartment facing the passenger seats there is a third full blind-flying panel. Extra instruments can be installed here for tests if required, or a number of people can watch the behaviour of a series of instruments without crowding into the control cabin and leaning over the pilot's shoulder.

The Anson is also fitted with the Sperry A.L.3 autopilot which is designed for medium-sized aircraft of this type. From its own independent gyro vertical it directs pneumatic control servos through valves operated by air pick-offs. Pitch-and-turn controls are provided for the pilot, together with a sensitivity control to allow for varying atmospheric conditions. It is connected to the gyro magnetic compass to maintain a selected heading. The autopilot can be manually over-ridden at any time.

This description gives some idea of the way in which aircraft flight instrumentation is progressing. We have not gone into details of the working of the devices described; the pilot, in any case, is concerned principally with the function, accuracy and limitations of his instruments, and with their appearance and clarity. The Sperry Anson is an impressive and encouraging machine, and we regard the two hours we spent flying it as a most valuable experience. If the all-weather pilot, either civil or military, can be provided with such instrumentation his prospects are far from bleak.

C.M.L.

## W. L. ALLARDYCE

HIS very many friends in the industry will be grieved to hear of the death of Mr. W. L. Allardyce, production manager of de Havilland's Hatfield works. He passed away last Friday morning in Hertford General Hospital following a short but severe illness involving two operations. He was 56. "Jock" Allardyce joined Sir Geoffrey de Havilland at the Aircraft Manufacturing Co. at Hendon immediately after World War I, in which he had served in the Scots Guards. He did not at once go over to the de Havilland Company when it was formed in September 1920 but joined it in January 1924 after three intermediate years with Handley Page, Ltd. He worked in the fitting shop—as he had done at Hendon—but was promoted to the staff in 1925, thereafter rising by stages to be assistant production engineer and—in 1940—works superintendent. He held that post throughout the critical war years and after, until his recent appointment as production manager, with responsibility for the entire output of aircraft and components.

*Mr. Allardyce.*

"The efficient running of the factory was his concern," writes one of his colleagues, "and in his energetic and cheerful mastery of the continuously changing scene he always had his finger on the pulse of every department and section; he knew literally hundreds of people personally, and understood their work and problems. The responsibility was a very great one and he gave himself unsparingly to it.

"Jock did much to make the character of the firm, and with his passing a part of that character is irretrievably lost, despite the fact that his influence will be felt and appreciated for many a long day."

Mr. Allardyce leaves a widow. A funeral service was held at Hatfield Parish Church last Tuesday, followed by cremation at Enfield Crematorium.

## AERONAUTICAL ART

THE Society of Aero Artists, whose formation was announced in a letter in our correspondence columns on March 26th, is to hold its first exhibition in London this summer. The venue will be the Guildhall Art Gallery, and Viscount Templewood, president of the Air League, will perform the opening ceremony on June 15th.

The secretary of the Society is Mr. M. B. Bradshaw and the headquarters are at 23 Albemarle Street, London, W.1.

*IN THE LINE: Watched by entrenched soldiers, a Sikorsky S-55, bearing a red cross to proclaim its mission, whirrs over the battle lines in French Indo-China. Reference to the magnificent work of ambulance helicopters in Korea is made by Mr. Lawrence D. Bell in a contribution on page 407 of this issue.*

# HERE AND THERE

### Farnborough Foretaste

A FAIREY test-vehicle rocket, similar to the one which the Duke of Edinburgh saw fired during his visit to Woomera, is to be exhibited at Farnborough (September 7th-12th) this year. The news was given by Col. R. T. Elvish, manager of the special projects division of the Fairey Aviation Co. of Australasia.

### "Night Ops" in Lakeland

LAKE WINDERMERE has been chosen as the location, in a few weeks' time, for the shooting of the final sequences in *The Dam Busters*, a film being made by Associated British Picture Corporation with R.A.F. co-operation. The Air Ministry has assured local authorities that, while "a certain amount of low flying" will be necessary to secure realism, the Lancasters taking part will be flown by experienced pilots.

### Danish Jet Ban Lifted

THE temporary ban on all jet flying in the Danish Air Force, imposed on March 19th, was lifted on the 24th. Lt-Gen. Christian Foersley, the C-in-C., said in Copenhagen that there would be a tightening of safety regulations, but it could not be continued indefinitely, as it was incompatible with training pilots on a war footing. He described the public criticisms (which, following a series of crashes, had led to the ban) as "exaggerated," but admitted that "there will always be pilots who ignore flying discipline."

### On the Never-Never

AIRLINE tickets to 83 different countries are to be offered on the instalment system by Pan American from May 1st. Passengers will pay 10 per cent down for their fares, and the remainder in up to 20 monthly instalments.

### Thunderflash/Thunderstreak

INFORMATION subsequent to that contained in a caption on p. 337 of *Flight* of March 19th makes it clear that only the RF-84F version of the basic Republic F-84F is known as the Thunderflash. The F-84F fighter/bomber continues to be called Thunderstreak.

### Hunters Come, Spitfires Go

IT has been announced in Holland that an initial batch of Hawker Hunters—which will be used for pilot-familiarization—will shortly be delivered from England to the Royal Netherlands Air Force. Meanwhile, Fokkers have completed their production of Meteor 8s and are starting on Hunters. The R.N.A.F. has just offered its 20-odd remaining Spitfires—mostly Mks 9 and 16—for sale; they were originally used by the famous No. 322 Sqn. and latterly by reserve units.

*"I said, 'I've never heard such a lot of drivel in all my life'."*

### Australia's First Helicopter

DESIGNER of Australia's first helicopter, Mr. G. C. Molyneux, said in Melbourne last week that he hoped to have his prototype flying by the end of the year. He is making model tests in what is believed to be a unique type of wind tunnel.

### A 2,500 h.p. Two-stroke

POWERING H.M. fast patrol boat *Dark Hunter*, launched on March 18th, is a Napier Deltic engine. An opposed-piston two-stroke diesel, it develops 2,500 s.h.p.; its power/weight ratio (4.2 lb/h.p.) is said to be the highest ever achieved in a marine diesel.

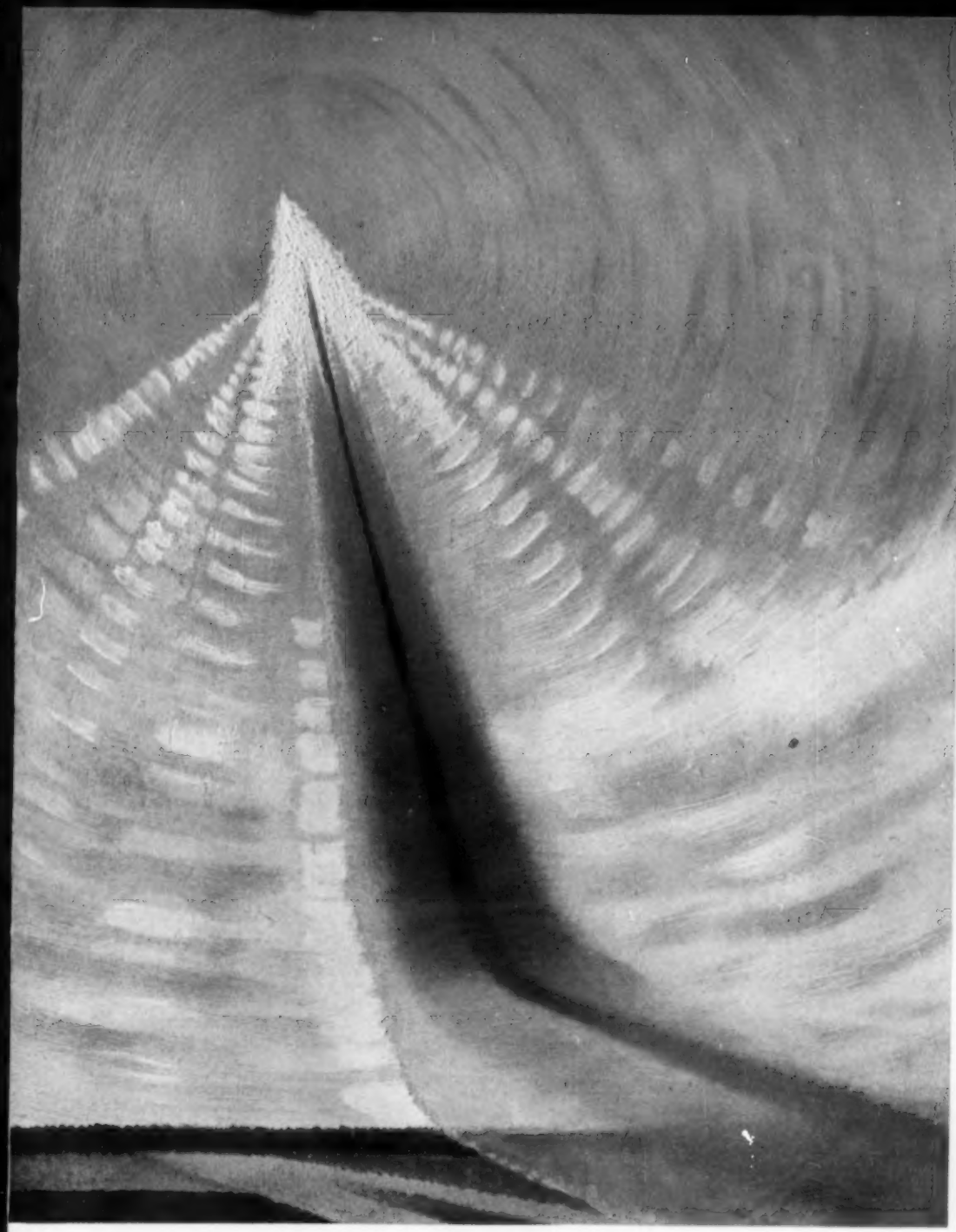
### Old Soldiers

THE last Harvard to be built by the Canadian Car and Foundry Company at Fort William, Ontario, has left the assembly line. Since the order was placed in 1951 nearly 600 Harvards have been produced in the factory for the R.C.A.F., U.S.A.F., and air forces of other NATO countries. Between 1941 and 1945 North American built 2,775 Harvards.

*STRAPPING IN before a flight in the first Bristol Sycamore helicopter for the Belgian Air Force (see paragraph below) is Major A. Parot. Bristol test pilot Peter Moore lends a hand.*

### Belgian Sycamores

A NUMBER of Bristol Sycamore Mk 4 helicopters have been ordered by the Belgian Air Force, who will use them mainly for ambulance and rescue operations in the Belgian Congo. The Sycamore was chosen, state the makers, because of its unusually good performance under tropical conditions, as demonstrated during flight evaluation with the R.A.F. in Malaya a year ago. (It may be recalled that for this purpose a Sycamore was flown to Singapore in a Bristol Freighter and for some three months operated almost continuously under conditions similar to those in the Congo.)



*This painting by Roy Nockolds, the first of a series of abstract designs specially commissioned by Armstrong Siddeley, gives something of the feeling of the immense thrust developed by the Sapphire turbojet propelling a fighting aircraft to its operational height in a matter of minutes . . . an essential requirement for the modern military aeroplane.*

## SAPPHIRE

*has been chosen for*

★ The Sapphire is manufactured under licence by the Wright Aeronautical Division of the Curtiss-Wright Corporation in the U.S.A., where it is known as the Wright J.65.

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**THE HAWKER HUNTER F.2** *fighter*

**THE GLOSTER JAVELIN** *all-weather fighter*

★ **THE REPUBLIC F.84F** (*Thunderstreak*) *fighter*

**THE HANDLEY PAGE VICTOR** *crescent-wing bomber*

★ **THE MARTIN B57** (*Canberra*) *bomber*

# ARMSTRONG SIDDELEY

*ARMSTRONG SIDDELEY MOTORS LIMITED • COVENTRY*

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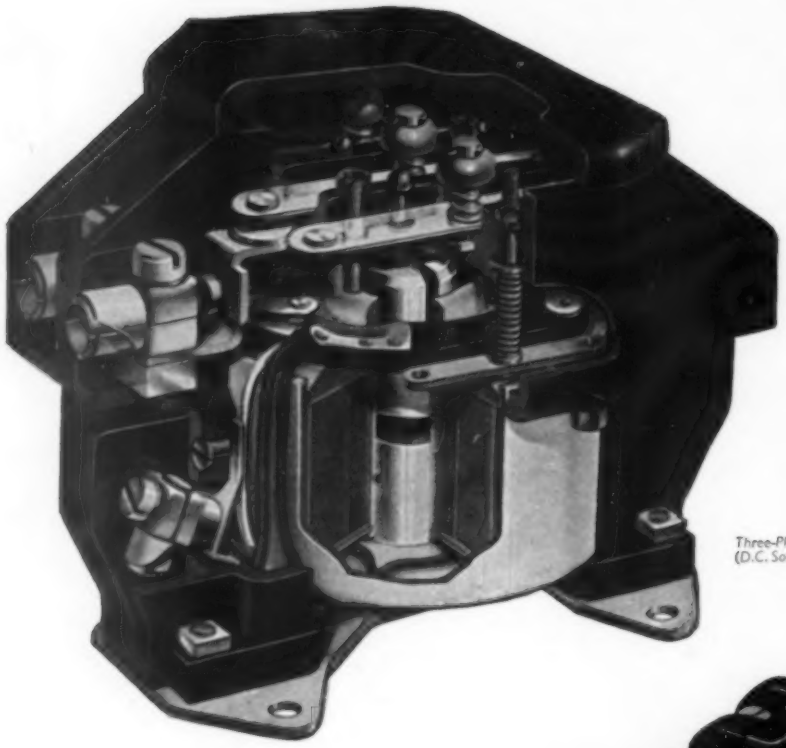
# The Electrical Aspect

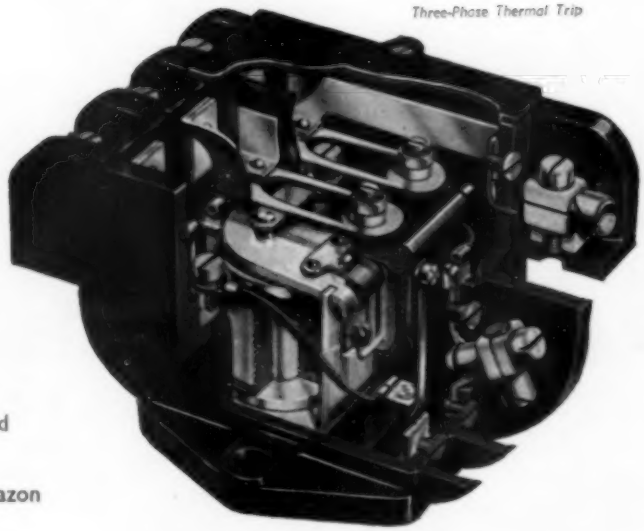


*Three-Phase Contactor (D.C. Solenoid operated)*

## Switchgear . . .

in relation to its application must be light, compact and easily maintained.

*Three-Phase Thermal Trip*



Extensive developments in the electrical power requirements of aircraft emphasized the need for a three-phase, 208-volt supply. Rotax accordingly designed and manufactured switchgear to keep pace with this new generating system.
Rotax has more experience than any other company in the design, development and manufacture of A.C. and D.C. generating systems and associated switchgear.
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PART I

*A "Flight" photograph of the B.E.1 in its original form, with 60 h.p. Renault.*

# THE B.E.2 SERIES

Historic Military Aircraft No. 7

By J. M. BRUCE, M.A.

*Oh! they found a bit of iron what*
*Some bloke had thrown away,*
*And the Raf said, "This is just the thing*
*We've sought for many a day."*

*They built a weird machine,*
*The strangest engine ever seen;*
*They'd quite forgotten the thing was rotten,*
*And they shoved it in a flying machine.*

*Then they ordered simply thousands more,*
*And they sent them out to fight.*
*When the blokes who had to fly them swore,*
*The Raf said, "They're all right;*
*The 'bus is stable as can be;*
*We invented every bit of it ourselves, you see!"*

*They were so darn' slow, they wouldn't go,*
*And they called them Raf 2Cs!*

from "Cinquante-Quatre."
(sung to the tune of "Dixie-Land")

THESE lines (in which "Raf" represents the Royal Aircraft Factory) represent perhaps the most printable of the multitudinous aspersions cast upon the B.E.2C's ancestry by the long-suffering (and too often short-lived) pilots who were condemned to fly it and its near-relations on war service. Probably no other aeroplane of the Great War, Allied or enemy, earned so much vilification and obloquy as were heaped upon the hapless "Quirk."

To trace the history of the B.E. series it is necessary to go back to April 1911, when a certain Voisin pusher biplane was sent to the Army Aircraft Factory for repair. This Voisin had a 60 h.p. water-cooled Wolseley vee-eight engine, and had been presented to the War Office by the Duke of Westminster. It has already been related (*Flight*, July 17th, 1953) how the S.E.1 was built by "reconstructing" a Blériot monoplane late in 1910, and the same subterfuge was again resorted to by the staff of the Factory in order to build a two-seat tractor biplane to the designs of F. M. Green and Geoffrey de Havilland.

The only component which was common to both the Voisin and the reconstructed machine was the Wolseley engine, but even that was soon replaced by a 60 h.p. air-cooled Renault. Since the new aeroplane was of tractor layout, it was given the official designation of Blériot Experimental, after Louis Blériot, who was regarded as a pioneer of the tractor configuration. The B.E.1 in its original form had a large flat radiator mounted between the front centre-section struts, and the Wolseley engine had a rudimentary hooded cowling. No doubt considerations of weight, drag, and crew visibility pointed to the desirability of removing the radiator, and may have been a deciding factor for the substitution of the Renault. With either engine, but especially with the Wolseley, the B.E.1 was remarkably quiet in the air compared with contemporary machines with rotary motors, and was known as "the silent aeroplane."

In structural and aerodynamic design the B.E.1 was advanced for its day, and considerable attention had been paid to the reduction of drag. The lower wing was slightly shorter than the upper, and lateral control was by wing-warping. There was no fin, and the rudder was attached to an unbraced upright post.

The B.E.1 had a long and useful career. In January 1912 it was used in some of the earliest experiments carried out with wireless equipment fitted to an aeroplane. With Geoffrey de Havilland as pilot and Capt. H. P. T. Lefroy, R.E., as observer, the B.E.1 carried out the first successful wireless-controlled artillery shoot in history on Salisbury Plain. In May 1912 Capt. Lefroy fitted the B.E. with a generator which was driven from the engine by bicycle chain. Experiments with wireless were continued in 1913 and 1914: the aeroplanes which were used were descendants of the B.E.1.

By the time of the wireless experiments the machine was on the strength of No. 2 Squadron of the newly-formed Royal Flying Corps, having been handed over to the Air Battalion in March 1912. It was flown by Capt. C. J. Burke, the first C.O. of No. 2 Squadron, and was often used at Farnborough for experimental purposes. This first B.E. survived many crashes and several undercarriages before its final demise in January 1915, by which time it had, in the words of Sir Walter Raleigh, "become the revered grandfather of the whole brood of Factory aeroplanes."

The basic design was refined in detail, and early in 1912 the first B.E.2 appeared, powered by a 70 h.p. Renault engine. It is difficult to

**THE chequered history of the B.E.2 series of "Factory-designed" aircraft is traced in this article, which we are publishing in two parts; the second will appear in an early issue. The author desires to record his indebtedness to Mr. D. Bruce Robertson, who contributed much of the information relating to serial numbers. Previous articles in Mr. Bruce's historic-aircraft series were: D.H.4 (October 17th, 1952), Bristol Fighter (November 7th, 1952), F.E.2 (December 12th, 1952), Handley Page 0/100 and 0/400 (February 27th, 1953), S.E.5 (July 17th, 1953), and Sopwith Pup (January 1st, 1954).**

## THE B.E.2 SERIES . . .

*A very early Vickers-built B.E.2.*

*A standard B.E.2A.*

*Experimental B.E.2A with oleo undercarriage and non-standard struts.*

*B.E.2A with fins above centre section, large screen, and revised tail.*

generalize about early B.E.2s, for true standardization had not arrived in 1912, and the type existed in more than one form. The earliest B.E.2s had wings of unequal span: there was no decking between the seats, but a small cowling was fitted behind the engine and gave some protection to the observer, who occupied the forward seat. Later B.E.2s had wings of equal span, and a short decking was fitted between the seats. There was, however, no cowling behind the engine, and a streamlined gravity tank was mounted high up between the front centre-section struts: the main fuel tank was under the observer's seat. The top decking abaft the pilot's seat was shorter by one bay than that fitted to the B.E.1. The Renault engine was the standard power plant, but B.E.2 No. 205 had at one time an experimental installation of a 60 h.p. E.N.V.

A B.E.2 made its mark in British aviation history in August 1912. On the 12th of that month Geoffrey de Havilland broke the British altitude record by climbing to 10,560ft in a B.E.2 with Major F. H. Sykes as his passenger: the climb took some 45 minutes. During the month this same B.E.2 was flown *hors concours* at the Military Trials, and again Geoffrey de Havilland was the pilot. Since it was an official design it was not allowed to compete, but it performed some of the tests to obtain comparative data. Its performance showed that it was by far the best all-round aeroplane at the trials, which were officially won by S. F. Cody's ponderous biplane. Fortunately for the early R.F.C. pilots, the Cody did not go into production, whereas the B.E.2 did.

Detail development proceeded, and the B.E.2A soon appeared, with decking behind the engine and a revised fuel system. The basic airframe remained unchanged. The fabric-covered fuselage had four wooden longerons with wooden spacers, the whole being cross-braced in the customary fashion: a rounded top decking was fitted behind the pilot's seat. The undercarriage had two long parallel skids which projected in front of the airscrew; the axle was bound to the skids by rubber cord, and longitudinal movement of the axle was prevented by radius rods. The wings had wooden spars, ribs, and riblets: these last-named components were about half the chord of the wings in length. Two bays of interplane struts were fitted on each side, and there was no stagger. The tailplane was a large, low-aspect-ratio surface of roughly semi-circular plan-form, made in one piece and mounted directly on top of the upper longerons.

In their day, the early B.E.s gave good service with the R.F.C. and R.N.A.S. The B.E.2A is perhaps best remembered for Capt. C. A. H. Longcroft's magnificent flight of about 650 miles in B.E.2A No. 218 of No. 2 Squadron, R.F.C., made on November 22nd, 1913. This B.E. had an extra fuel tank fitted in the front cockpit, which was faired over: the installation was devised by First Class Air Mechanic H. C. S. Bullock. On this machine Capt. Longcroft flew non-stop from Montrose to Portsmouth and back again to Farnborough, the whole journey being accomplished in 7 hr 20 min.

History was made by B.E.2A No. 347, also of No. 2 Squadron, when, at 8.20 a.m. on August 13th, 1914, it landed near Amiens: it was the first British aeroplane to land on the Continent after the outbreak of war. The pilot was Lt. H. D. Harvey-Kelly, who had left Dover at 6.25 a.m. (Harvey-Kelly was shot down and killed by Kurt Wolff on April 29th, 1917.)

Squadrons No. 2 and 4 went to France on August 13th, 1914, equipped throughout with B.E.2As and 2Bs, and nine additional machines of the type were taken over by the Aircraft Park, which landed at Boulogne five days later. The Eastchurch Squadron of the R.N.A.S. did not go to France until August 27th: its equipment was a motley collection of two Sopwith biplanes; two Blériot monoplanes; one Henri Farman; one Bristol T.B.8; the Short, No. 42, converted to a landplane; and three B.E.s.

One of these B.E.s was faithful No. 50. Built by Messrs. Hewlett and Blondeau, this machine was delivered to the R.N.A.S. at Eastchurch in January 1914, and there formed part of the equipment of the unit commanded by W/C. C. R. Samson. Samson himself flew No. 50 a great deal, and regarded it as his own machine. This B.E.2A flew in the 1914 Naval Review at Spithead, and when war broke out it went to France and Belgium, where it did good work. At about that

B.E.2B.

*Prototype of the B.E.2C.*

*Production type, Renault-engined B.E.2C.*

*B.E.2C with R.A.F. 1a engine, vee undercarriage and camouflage.*

time it carried, somewhat optimistically, a rifle firing incendiary bullets for anti-Zeppelin work, and made several bombing raids, notably on Ostend and Zeebrugge. When Samson's squadron went to the Dardanelles No. 50 was among their equipment, and played her part nobly. She was still with the squadron when it was designated No. 3 Wing, R.N.A.S., and as late as September 18th, 1915, she took a 100lb bomb to Berghaz Liman, where the missile suitably discomforted enemy shipping. Of No. 50, Samson wrote (in his *Fights and Flights*) "She went right through the Dardanelles Campaign, doing a lot of useful work, though at the last I must say I only flew her occasionally simply for old acquaintance' sake." No. 3 Wing returned to England in January 1916, but by then No. 50 was considered to be unfit to travel, and she was broken up.

From the historical standpoint, the early B.E. design has no greater claim to fame than the fact that it was the type on which the first flying V.C. was won. The award was made posthumously to 2nd Lt. W. B. Rhodes-Moorhouse of No. 2 Squadron, R.F.C., for his great gallantry in bombing Courtrai railway station on April 26th, 1915. He came down to 300 ft to drop his 100 lb bomb, and was mortally wounded immediately afterwards. Despite other wounds sustained on his homeward journey, Rhodes-Moorhouse flew his B.E. back to his squadron's aerodrome at Merville, although there were others at which he could have landed sooner. He died from his wounds the next day.

Much early experimental work was carried out with B.E.2As. Experiments with oleo undercarriages had begun as early as 1911, and various forms were fitted to B.Es. One was similar to that used on the F.E.2B and R.E.7: the B.E.2A which had this undercarriage also had a modified tail unit incorporating a fixed fin and strut-braced tailplane. Other oleo undercarriages had varying forms of the standard twin-skid layout, and one of the B.E.2As so fitted had modified interplane struts. One of the early B.E.s was used in experiments with all-metal airscrews in the spring of 1914. Aluminium and steel were the metals used to make the airscrews, and the preference of the time was for the latter metal. Of interest also was the B.E.2A which had two substantial fin surfaces above the centre-section; a somewhat similar arrangement was also fitted to an R.E.1. This B.E.2A, too, had a modified tailplane braced from a central kingpost, and a very large windscreen was fitted in front of the pilot's cockpit. The machine was probably used in the stability experiments mentioned later in this history.

The basic design continued to be improved in detail, and in 1914 the B.E.2B appeared. This machine had a revised fuselage with deeper coamings around the cockpits: indeed, this fuselage form was retained in the B.E.2C. The disposition of the elevator controls was also modified, and the cables were wholly external from a point just aft of the pilot's seat to the control horns on the elevators. In its ultimate form the B.E.2B was fitted with ailerons in place of the warping-wing control which had been used on all preceding B.E.s. There can be little doubt that at least some B.E.2Bs were produced by rebuilding B.E.2As.

On June 10th, 1912, a young Cambridge graduate named Edward Teshmaker Busk took up an appointment as assistant engineer physicist at the Royal Aircraft Factory. He had been trained as an engineer, but was keenly interested in flying, and had begun to fly on Valkyrie monoplanes at the Aeronautical Syndicate Ltd.'s school at Hendon in February 1912. After his appointment to Farnborough, he continued his flying under the guidance of Geoffrey de Havilland until he was able to fly well enough to carry out the many experiments he made in studying the problem of stability—a flying quality which at that time was considered to be highly desirable.

Busk began his experiments with the B.E.2A, and flew it up to and beyond the limits of its controllability at a time when practically nothing was known about the behaviour of aeroplanes after loss of control. By June 1914, after months of patient work, he developed the B.E. design into a completely inherently stable aeroplane: this was B.E.2C. The first machine had the fuselage of a B.E.2B but with non-standard arrangement of the control leads to the tail surfaces. The engine was the usual 70 h.p. Renault, mounted with its sump uncowled in the manner of all early B.E.s, and with long exhaust pipes running along the underside of the fuselage.

## THE B.E.2 SERIES . . .

The tail unit was considerably modified, and now incorporated a triangular fixed fin, whilst the tailplane had been revised to consist of a rectangular surface mounted between the upper and lower longerons of the fuselage, and braced by tubular struts to the fin-post. On the prototype and early production B.E.2Cs the tailplane was made in one piece, but on later machines it was divided: at the same time as this modification was introduced the tubular stay-rods which braced the tailplane were replaced by Raf-wires. The most noticeable differences between the B.E.2C and its forerunners were the marked stagger of the mainplanes and the revised plan-form of the wing-tips.

The structure remained fundamentally unchanged, and was almost wholly of wood. The fuselage was a typical wooden structure, with wire cross-bracing: it was made in two parts, which were connected by fishplates immediately behind the pilot's seat. The spars of the lower wings were connected through the fuselage by steel tubes, the rear one of which passed below and outside the fuselage; and the centre section struts were also lengths of steel tube, faired with wood. The fin and rudder were both formed of steel tube.

That Busk's work was brilliant there can be no question, but he did not live long to enjoy his success. In the late afternoon of November 5th, 1914, he was test-flying a B.E.2C fitted with the first R.A.F.1 engine when the aircraft burst into flames at about 800ft and crashed on Laffans Plain. Busk was 28 when he died, and his aerodynamic work was only begun. It is ironic and needlessly unjust that the machine which was the product of his genius should later be execrated with greater frequency and vehemence than any other aeroplane, before or since. The fault lay not in the B.E.2C itself, for it was a safe and satisfactory aeroplane, nor with those who first ordered it to be standardized for R.F.C. equipment; but a charge of something approaching criminal negligence could be brought against the authorities who continued to order its manufacture in great quantities even after it had been proved useless as a military aircraft. The decision to standardize the design was taken in 1914, and contracts were hurriedly placed with various manufacturers as the threat of war increased during the summer of that year. No B.E.2Cs were built at the Factory itself.

The early production machines retained the 70 h.p. Renault and the undercarriage skids of the early B.E.s, but a refinement was soon provided in the shape of a cowling over the sump, though not all of the earliest 2Cs had this feature. An auxiliary mid-bay flying wire was fitted on the front spar of the outer wing bays, and the wings were of R.A.F.6 section, rigged at 3 deg 30 min incidence. Ailerons were now standard control surfaces: the actuating cables ran under the lower wing; upper and lower ailerons were connected by cables, and both upper ailerons were connected by a balance cable running above the upper wing. The movements of the rudder bar were transmitted by cables to another parallel control member mounted under the pilot's seat: this was known as the rocker bar, and protruded through the fuselage on each side. From the extremities of the rocker bar control cables ran aft to the control horns on the rudder.

Not every contractor regarded the B.E.2C as a good production proposition. One of the earliest manufacturers to receive contracts for the type was Sir W. G. Armstrong Whitworth & Co., Ltd., but after examining the drawings the firm decided the machine was unnecessarily complicated. They undertook to produce an aeroplane which was structurally simpler but equally efficient, and were granted permission to do so. Such was the origin of the Armstrong Whitworth F.K.3, the "Little Ack."

By the spring of 1915 numbers of the 90 h.p. R.A.F.1a engine were coming off the production lines. The R.A.F.1a was developed from the Renault, and was of similar configuration, so it was a comparatively simple matter to substitute the more powerful engine in the B.E.2C airframe. It became the standard power-plant of the B.E.2C, and was fitted with a wide variety of exhaust pipes. Some B.E.s had short manifolds only; others had downwards-turned pipes of varying lengths; many R.N.A.S. machines had very long pipes on either side of the fuselage, exhausting behind the rear cockpit; but

*Standard B.E.2C with Lewis gun mounted.*

*R.N.A.S. pattern B.E.2C, with bomb carrier under engine.*

*Armoured B.E.2C*

*B.E.2C with 150 h.p. Hispano-Suizaengine.*

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(*Top*) The beacon with its compact transmitting equipment can be housed together with stores, office and power supply in the hut which supports the tower and counterpoise aerial.

(*Above*) A typical duplicated installation comprising 200-watt beacon transmitters, goniometers, monitor and control units.

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LA 1

## THE B.E.2 SERIES . . .

perhaps the best-known arrangement was the two funnel-like exhaust stacks which discharged above and in front of the centre section.

Another early modification to the design was the introduction of a plain vee undercarriage in place of the twin skid structure which had been standard on B.E.s since the appearance of the B.E.1. Each vee was formed of steel tubes welded and pinned together, and faired with wood. There were two steel tube spreader bars, and the axle lay between them: it was bound to the apex of each vee by 44 feet of $\frac{3}{8}$ in-diameter rubber cord. It should be noted, however, that in a few B.E.2Cs the skid undercarriage and R.A.F.1a engine appeared together: conversely, some Renault-powered 2Cs had the vee undercarriage. Early-production B.E.2Cs, both Renault- and R.A.F.-powered, had cables as the wing-bracing medium, but in later machines Raf-wires of streamline section were fitted and adopted as standard.

A major modification was the standardizing of wings of R.A.F.14 section at an angle of incidence of 4 deg 9 min. Some B.E.2Cs had an oleo undercarriage with a small nose-wheel, like that used on the R.E.7 and F.E.2B, and a few of these machines went to France. At least one was used by No. 4 Squadron and another by No. 16 Squadron, but there can be little doubt that the oleo undercarriage must have reduced the already poor performance to a dangerously low level.

*To be concluded.*

*B.E.2C with oleo undercarriage.*

# SHOCK-WAVES ILLUSTRATED

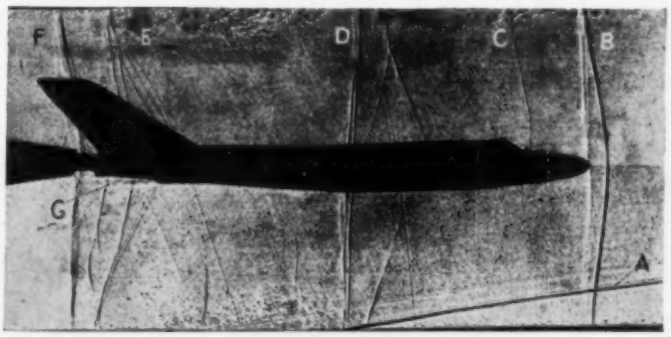
THE photograph (right) gives a remarkably clear picture of the shock-wave structure associated with the flight of a modern high-speed aircraft. It shows a model, at a Mach number of 1.1, in the transonic wind tunnel at Armstrong Whitworth Aircraft at Coventry, and, together with the second picture, is reproduced from the March issue of the *Hawker Siddeley Review*.

In the *Review*, an explanation by Dr. W. F. Hilton, B.Sc., D.I.C., Ph.D., the company's chief aerodynamicist, accompanies the photographs. In this Dr. Hilton states:

"At supersonic Mach numbers, the aircraft is always preceded by a shock-wave, and at low supersonic speeds the shock-wave takes the form of a bow wave standing ahead of the nose at B. The pilot's canopy also exhibits a detached bow wave at C. The flow at A ought not to be confused with the shock-waves. It is a deflection from the glass window.

"Farther back, we see the wing shock-wave, D, and the waves due to the tail unit, E. The wave F is due to the balance behind the model, and this photograph establishes that the balance must be placed a great deal farther back from the tail if valid readings are to be made so close to the speed of sound. Obviously, a shock-wave due to the support cannot be allowed to fall on any part of the model.

"Finally, the speed of the spark photograph (one millionth of a second) is sufficient to arrest the motion of the wing wake shown at G (forward of the mounting attachment). There is evidence in other photographs that the wing-tip vortex is also visible."




(Left) *The swept-wing model being mounted in the A.W.A. transonic tunnel by Mr. E. C. Carter.* (Above) *One of the resulting pictures, obtained at Mach 1.1, showing clearly the bow wave and other shock-waves. Details shown are described in the text.*

## CANADIAN BRISTOL APPOINTMENTS

ANNOUNCEMENT has been made in Montreal of a number of executive changes in the organization of the Bristol Aeroplane Co. of Canada, Ltd.: W. S. Haggett, sales manager for Canada, becomes sales manager for the company's Eastern and Western engine overhaul plants, and has also assumed responsibility for sales in the United States. J. H. Holt, formerly with the parent company in England, has been appointed general manager of Bristol Aeroplane Engines (Western), Ltd., upon retirement of W. D. Kennedy.

J. R. Hutton has been appointed manager, engineering, Bristol Aeroplane Engines (Eastern), Ltd., and H. V. Wright, who has asked to be relieved as managing director of the latter company, remains as a director and consultant. He will also act in the same capacities for Bristol Aeroplane Engines (Western) Ltd.

## WILLIAMSONS CELEBRATE

FOR the 48th time Mr. Colin Williamson, the chairman of the aerial camera manufacturers bearing his name, attended the firm's annual dinner in London, held this year on March 19th. Last year he was away in Australia, visiting his daughter, but took the precaution of recording a greeting and sending it to the assembled gathering.

Much of the company's work is of a secret nature and could not be divulged—especially in an after-dinner speech; but of the prospects of Williamsons the chairman said: "Further developments will give some of our employees an excellent opportunity to pay more income tax." The new factory at Reading is now in production. It will be remembered that Williamsons have recently produced the F85 panoramic air camera, under a Ministry of Supply contract, and the new Type L.S.P. plotter.

# WAVE FLYING—THE HARD WAY

## *A Comprehensive Report on the Menace of the Mountain Wave*

WHY do aircraft sometimes fly into mountains? The correlation between the periodical accidents of this type and standing-wave conditions in the atmosphere has been suggested and discussed many times. A review of existing knowledge, with particular reference to a Dakota accident near Snowdon, was given by A. H. Yates in an article, "Airflow Over Mountains," in *Flight* of January 2nd, 1953. A summary of an American report* recently received has provided added detail to our picture of wave conditions, and it includes a particularly vivid account of what a pilot experiences when flying through—or attempting to fly through—a typical "mountain wave."

Many readers will already know that a mountain wave is a disturbance of the atmosphere set up by mountain barriers, and possessing a wave-like airflow in which severe turbulence, vertical currents and altimeter errors combine to form dangerous flight conditions. To expand this picture, we print below the main facts from the report: first, in slightly abridged form, the account of a typical flight in wave conditions (based on a large amount of actual flight experience), and secondly a summary of the methods and conclusions of the extensive research programme undertaken.

**A Typical Wave Flight.** Let us suppose [the account begins] you are fighting strong headwinds at 10,000ft altitude in a moderate-speed aircraft. Two hundred miles ahead is X-Mountain.

There are not many clouds around and visibility is very good. The air is smooth up here although in the lower layers it is quite turbulent. You are flying with a slight drift correction. Some time ago you spotted a long white cirrus band over the horizon far ahead. At about 100 miles from X-Mountain you notice that this cloud bank seems to extend just along the mountain range although at a much higher level than the peaks of the range. Apparently it does not move despite strong upper winds. The summits of X-Mountain are covered by a white cloud blanket.

Every minute you can see more details. The high cirrus cloud ahead consists of a few parallel banks extending from right to left, normal to the wind. As you approach this cloud it does not look as white and harmless as it looked from 200 miles away. There are dark, dense parts in it and you would not dare to guess how high it is. You would not even call it a cirrus cloud any more. It looks more like a big altocumulus cloud. You can see that this cloud is composed of a number of layers staggered vertically like pancakes. The leading (upwind) edge appears quite sharp and seems to follow every bend in the long mountain range.

Farther upwind blue sky extends over the flat cloud blanket ("cap cloud") which covers the mountain tops. The high cloud extends only downwind of the mountain. It is a "lee cloud."

You are now 50 miles from X-Mountain. Climbing slowly you should be able to pass below the high altocumulus cloud and then above the cap cloud and X-Mountain. There is a wide gap of blue sky between these two cloud layers, and except for some long lines of cumulus under the high cloud bank, you do not expect any clouds on your flight path and head directly into this gap.

Apparently there are two of these cumulus lines extending from right to left just this side of the mountain range. They look so harmless that you really do not worry about penetrating them. The row nearer you consists only of some broken ragged cloud pieces (fracto-cumulus). They seem to be just about as high as the mountain tops and the cap cloud. The cloud line nearer the mountain range looks much more dense and builds up higher than the cap cloud over the mountains, although it is certainly not comparable in depth to the big shower clouds you had to penetrate sometimes. There is here no indication of precipitation.

As you cannot estimate how much space exists between X-Mountain and the cumulus lines, you have to decide now if you want to pass beneath, above, or through the cumulus clouds. You decide to continue your flight towards the cloud gap by climbing steadily. You will probably pass through the first tiny cumulus line which is now only a few miles ahead. Fixing your eyes on some of the cloud fragments you notice that they show strong rolling motion. You remember having heard of a "roll cloud" and anticipate some turbulence.

Upon contact with the first cloud pieces, your ship banks steeply and you are thrown against the ceiling of your cockpit. You have your hands full to regain control of the plane and you do not find any time to watch your altimeter or rate of climb indicator. Nevertheless, you feel that the ship is climbing and descending rapidly in what you would call severe turbulence. This dance lasts only one or two minutes then suddenly the air is smooth again and you have a good rate of climb. You have passed the first roll cloud and have time now to fasten your shoulder straps and to think your situation over. Looking upwards you notice that the high cloud is now huge and compact, completely shading the countryside. Your decision to climb over the cumulus lines seems justified by your first experience.

The rate of climb is unusually good after passing the first roll cloud. You can already see over the next cloudline, which seems to be 5 to 10 miles ahead, and you should have plenty of height to clear even the highest cloud tops of this roll cloud. With the air quite smooth you are confident that you are out of trouble by now. Looking down at the valley floor you notice that jet-like dust streaks indicate strong surface winds. Your progress is slow. Apparently the upper winds are very strong.

Now you are high enough to look down on the next roll cloud. The cap cloud over X-Mountain ahead is snow-white in the brilliant sun. It seems to pour down the mountain slope like a cloud waterfall. Farther upwind the cap cloud merges with the horizon and it is hard to estimate whether you are higher than this cloud layer or not. The huge altocumulus cloud above is even darker now. The leading (upwind) edges of the different pancake layers are staggered toward the wind. The highest one is still far ahead and shows a brilliant white rim. Now you can see the profiles of the staggered layers. They are lens-shaped and you remember having heard meteorologists say that so-called "lenticular clouds" occur frequently over mountains.

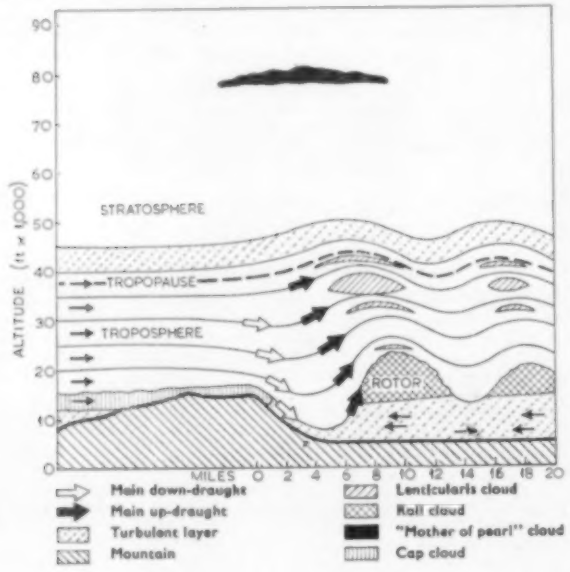
Something unexpected must have happened suddenly. The roll cloud ahead has started to build up quickly in front of you. Looking downwards you notice that the plane does not seem to be making any headway. Now the first cloud drifts by under the plane. If the cumulus continues to rise that way you are not sure that you can make it.

A glance at the rate of climb indicator reveals what is going on: the ship is falling at over 2,000ft/min in completely smooth air. What you need now is ground speed. With the nose down and full power, clouds seem to shoot by underneath the plane but the ground still does not show noticeable movement. The rate of descent is now 2,500ft/min. A big cumulus turret builds up ahead and engulfs the plane. You have fallen into the roll cloud.

What follows is no longer controlled instrument flight. Heavy gusts make all the instruments dance. The speed drops down, then shoots up, the r.p.m.s are changing rapidly and the engine is

*Flight Aspects of the Mountain Wave: a Summary of Air Force Surveys in Geophysics, No. 35, by J. Kuettner and C. F. Jenkins. (Published by the Flight Safety Foundation, New York.)*

*Fig. 1. A cross-section through a typical mountain wave. Main dangers to pilots occur in the "rotor" or "roll" cloud, and in the main down-draught zone. Up-draughts and down-draughts can reach 5,000ft/min.*



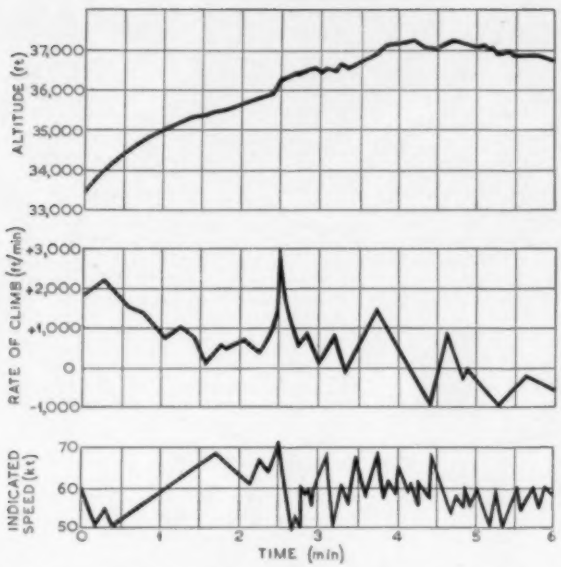



*Fig. 2. Sailplanes were used extensively in wave research. This six-minute flight record shows high-level turbulence encountered on one flight: note the enormous changes in rate of climb.*

howling. Several times you hang in your belt without the slightest idea of attitude. You have not encountered anything like this before. You recall a thunderstorm flight which scared you to death but the turbulence was nowhere near this bad.

Suddenly you drop out of the cloud base and the view excites you: everything seems to have changed. X-Mountain looks down on you like a big barrier, the clouds sweeping down its slopes with visible speed and dissipating just in front of you. You are about ready to turn back when your plane is lifted with enormous power. In heavy vertical gusts your rate of climb jumps to 1,000ft/min, later to 2,000ft/min. The leading edge of the cumulus line is now just above you. To avoid being pulled back into the roll cloud you push the nose down. Apparently you now have a good ground speed and the ship is climbing fast just in front of the cloud line which looks like a long railroad train.

Suddenly the gusts die out. The air becomes smooth as glass. But your rate of climb is now 2,500ft/min. You are stunned by the fact that such extreme degrees of smoothness and turbulence can co-exist so closely in the atmosphere. Looking back after a few minutes you notice that you are already higher than the top of the cloud. You are now flying at a safe level. That should be enough finally to cross X-Mountain and the cap cloud. Your altitude is 3,000ft over X-Mountain and probably 2,000ft over the cap cloud. There is no roll cloud line ahead now and you have reason to believe that you are out of trouble.

The foot of X-Mountain lies just below you. The trailing edge of the cap cloud is only one mile ahead. The cloud mass pouring down the mountain slope and dissipating is a fascinating spectacle. The upwind edge of the high lenticular cloud is directly overhead, maybe between 30,000 and 40,000ft.

The ship makes good headway now but the up-draught is tapering off and you need more power to keep altitude and ground speed.

High as you are above the low-level clouds you feel almost—but not quite—safe. This completely smooth air has proved treacherous before and you are not sure what it has in store for you this time. The crestline of the mountain is not yet passed and ground speed seems to drop again. After another minute the low clouds look nearer. There has been no indication of what your altimeter and rate of climb now reveal: you are falling again at 1,000ft/min, and full throttle does not help. You feel if you can go another mile upwind you should be through.

But once more there is this unfortunate combination of a jetlike headwind and a strong downdraught. You have been running through several consecutive up and down draught areas. This is indeed the pattern of an atmospheric wave. In another minute you will know if you can pass X-Mountain. The cloud waterfall is directly beneath the plane now.

But in front of you the cap cloud climbs fast. The air is still quite smooth, but now you are falling at about 3,000ft/min. Three thousand feet per minute? That means you will crash into the mountain within another minute. What does your altimeter show? A thousand feet above the highest peak of X-Mountain. But now you can see a mountain peak through the cap cloud. That is certainly not 1,000ft below you. It is just about your present height. Altimeter wrong? Only a quick decision will save you. Turn back.

While you bank in a steep left turn the air becomes hazy. A glance at the instrument panel and the mountains shows that you are falling at almost 4,000ft/min into the lower end of the cloud waterfall. Suddenly a terrific gust banks the airplane into a steep right turn towards the mountain. For a moment you see the rocks of the mountain rapidly coming nearer. Then you succeed in manoeuvring the plane away from the stone wall.

You are right in the foot of the cloud waterfall which looked so smooth from above and the airplane shoots with an enormous tailwind 1,500ft over the valley floor. As the heavy gusts diminish you look back on the towering mountain range and the cap cloud which only a few minutes ago lay under your feet.

In a matter of moments you have passed under the two roll clouds and the nightmare is over. You decide to do what you should have done in the first place: change your flight course, flying around X-Mountain and a full-scale "Mountain Wave."

**Wave Investigations.** In order to investigate this type of airflow, the "Mountain Wave Project" was commenced, sponsored jointly by the Geophysics Research Directorate of the Air Force Research Centre, Cambridge (Massachusetts), and the U.S. Office of Naval Research. It was conducted by the University of California Soaring Association, together with a number of Government and private organizations, and the field tests were made during 1951-52 in the Sierra Nevada mountain range in California.

Conditions of temperature, pressure and wind were investigated up to a record height of 44,500ft by the use of specially instrumented sailplanes, which were tracked by radar, Raydist, and cinetheodolites. Time-lapse cameras took motion pictures of the associated cloud structures from the ground, and meteorological stations were established on both sides of the mountain range up to an elevation of 9,000ft.

It was found that the phenomenon of the mountain wave is essentially the same as the flow of water over a barrier which forms rapids and waves downstream, but with added comp'ications due to atmospheric variables such as temperature, humidity and wind. The troposphere shown in Fig. 1 consists of two layers separated by a temperature inversion on top of the cap cloud. At least two processes work simultaneously: (1) a "spill-over" of the lower layer which shoots down the mountain slope with increasing speed after passing the crest, and (2) an internal lee-wave in the upper layer which forms in the wake of the mountain barrier.

The following conditions favour the formation of waves:—

(a) Wind flow perpendicular to the mountain range line and with a speed of more than 25 kt at mountain top level.

(b) A wind profile showing a strong consistent flow extending several thousand feet above the mountain tops, or showing an increase in speed with altitude.

(c) An inversion or stable layer somewhere between the mountain tops and the 600 millibar level.

The down-draughts to the lee of the rotor, and the up-draughts below it, can carry a plane into the rotor cloud while a pilot is attempting to pass above or below this cloud. If the aircraft approaches the crest of the mountains from the downwind side with insufficient height, it will be practically impossible to climb through the air currents near the mountain slope. These conditions plus the fact that the peaks are hidden most of the time make it probable that an aircraft fighting strong headwinds at minimum clearance altitude would fly into the mountain peaks.

As the barometric pressure is considerably disturbed in the mountain wave, altimeter errors are associated with the wave conditions. The maximum total error possible (giving a high reading) has been estimated to be about 1,000ft, but errors as much as 2,500ft near the mountain peaks have been claimed by pilots.

On some occasions, when meteorological conditions are favourable for the creation of a mountain wave, the lack of moisture in the atmosphere can prevent the formation of clouds. The main danger of this cloudless or "dry" wave is that it lacks the warning features provided in most waves by recognizable clouds. More serious still is the case where the wave flow is completely obscured by a thick overcast with a low ceiling.

The following rules of flight are suggested to pilots for flights over mountain ranges when wave conditions exist: (a) If possible, fly around the wave area. If not, fly at least 50 per cent higher than the height of the mountain range. (b) Do not fly high-speed aircraft into the wave; particularly, do not fly downwind. Structural damage may result. (c) Avoid the rotor (roll) cloud. (d) Avoid the cap cloud (foehnwall)* area with its strong down-draughts. (e) Avoid high lenticular clouds if the edges are very ragged and irregular, particularly if flying high. (f) If flying against the wind, up-draughts areas, especially the one upwind of the rotor clouds, may be used as an aid in gaining the altitude necessary to pass through the down-draught areas and cross the mountain range. (g) Do not place too much confidence in pressure altimeter readings near the mountain peaks. (h) Avoid penetrating a strong mountain wave on instrument flight.

**"Foehn" is a meteorological term for the air current descending from a mountain range.*

# AIRCRAFT INTELLIGENCE

*LONG RIFLE OF THE AIR AGE is an American description applied to the Boeing B-52 eight-jet bomber, the first production model of which is seen on the occasion of its "roll-out ceremony" at Seattle. The B-52 has a wing span of 185ft, is 156ft long and 48ft high. The gross weight is more than 350,000 lb. Note the folding fin—a characteristic Boeing feature.*

### Great Britain

*Marathon 2 with Leonides Majors.* It is learned that the Marathon 2 airframe formerly used for the testing of Armstrong Siddeley Mambas is being experimentally fitted with two Alvis Leonides Major 14-cylinder radials. It should appear at the S.B.A.C. Display this year.

### Canada

*Canadair-built Sabres.* Mr. J. Geoffrey Notman, president and general manager of Canadair, Ltd., has disclosed that the Canadian Government recently ordered an additional quantity of North American F-86 Sabres from his company. The contract will mean $24 million worth of new business. The machines will be Orenda-powered and will be supplied to R.C.A.F. squadrons in Europe. It is pointed out that Canadair-built Sabres have enabled Canada to meet her commitments to the NATO forces on time, and there are now four fully operational wings (*i.e.*, twelve squadrons), comprising more than 300 Canadair-built Sabres, in Europe. In all, the Canadair have built more than 900 Sabres.

### United States

*Robertson SRX-1.* This 5/8-seater monoplane, reports *Aviation Week*, is serving as a prototype in the development of a "zero-length take-off" aircraft, to be powered by two Continental turboprops geared to contra-rotating airscrews. High-lift devices include extensive leading-edge slats and trailing-edge flaps. The prototype SRX-1, otherwise known as Project Skylark, has a 260 h.p. Continental piston engine and has attained 163 m.p.h. in level flight. The minimum power-on speed is given as 24 m.p.h., and take-off and landing runs of 100ft have been recorded. Estimated top speed of the turboprop-powered SGTC development is 335 m.p.h.

*Boeing B-47 with J57s.* High-altitude tests are in progress with a Boeing B-47 bomber powered with four Pratt and Whitney J57 split-compressor turbojets instead of the standard six General Electric J47s. A "phenomenal" performance is reported.

*Remote-controlled B-47.* The Boeing company has made successful take-offs, flights and landings with a B-47 under remote control. The human safety pilot did not touch the controls. Guidance problems are said to have led to the suspension of the project.

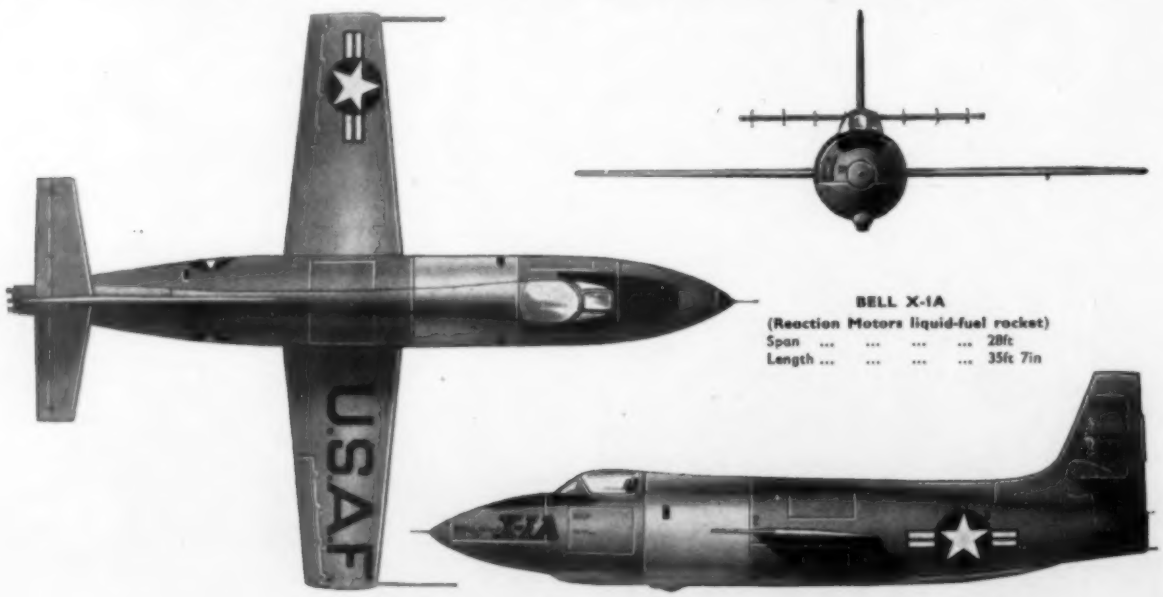
*Lockheed XF-104.* This straight-wing, supersonic, light fighter, which is believed to have a downward-ejection seat, has made its first hop at Edwards A.F.B., covering about a mile.

### France

*S.O.4050 Vautour.* One of the two prototypes of this twin-Atar multi-purpose aircraft was recently flown by two officers of the U.S. Flight Test Services. Although the makers cannot disclose the results of the tests (which have been conveyed to U.S. and French authorities), they do say that they have every reason to be satisfied with the American pilots' appraisal of the Vautour's qualities.

### Holland

*Dutch-built Scandias.* In Fokker's Amsterdam-Noord factory the six Saab 90A-2 Scandia twin-engined transports which are being built under a Saab contract are approaching final completion. Fuselage construction and final assembly is Fokker's responsibility, while wings, tails and other components are built by the Aviolanda and De Schelde companies. The latter factory is also producing the Saab 91B and C Safir. Four of the six Scandias have been ordered by the Brazilian VASP line, and the remaining two will be delivered to S.A.S. The Scandia is powered with two Pratt and Whitney R-2180 E1 Twin Wasp engines, each delivering 1,400 h.p. at 7,000ft. The gross weight is 35,280 lb. and the cruising speed 242 m.p.h. at 10,000ft.




**BELL X-1A**
**(Reaction Motors liquid-fuel rocket)**

| | |
|---|---|
| Span ... ... ... ... | 28ft |
| Length ... ... ... ... | 35ft 7in |

*Powered by an Armstrong Siddeley "Double Mamba"*

THE Royal Navy, which has to maintain sea communications, regards counter-measures to the submarine threat as of first importance. Much of the new anti-submarine equipment is specialised, and demands unique capabilities and characteristics from the aircraft employed. To cover this feature of defence the Fairey Gannet is in super-priority production, and has also been ordered for the Royal Australian Navy.

# FAIREY AVIATION

THE FAIREY AVIATION COMPANY LIMITED · HAYES · MIDDLESEX

# GYRON

*This striking take-off picture was secured at Toulouse by photographer Dengremont, who was flying in formation in a second machine.*

# FOUGA C.M. 170 IN THE AIR

NUMBER 51 OF THE SERIES

*By THE EDITOR*

NOW is a most interesting time to be talking about, and flying, jet trainers. All countries are trying to settle their training programmes leading up to the newest generations of sonic jet fighters and near-sonic bombers, and at the same time to select and order suitable aircraft to carry them out. The R.A.F. can fairly claim to have had a very large share of the work in connection with developing and standardizing flying-training techniques and schedules for many years past, and to have achieved considerable success.

It is generally accepted that three training stages, using only three different types of aircraft, is the ideal at which to aim; the R.A.F. consider this to be the most that can be accepted economically. Yet month by month the scope of the training—better described, perhaps, as the experience-gap between the pupil on his first flight and the operational pilot—is increasing. Clearly as much as possible must be got out of each aircraft and each stage of instruction.

The R.A.F. has already evolved a fairly clear-cut new scheme for basic and advanced instruction, using the Provost and the Vampire T.11, and the first courses on these new trainers have successfully passed out. The best new aircraft to carry the training a step further towards Swift, Hunter, Canberra and perhaps Valiant has yet to be decided, and in the meantime the Meteor 7 does good work.

At the lower end of the scale a small batch of Jet Provosts has been ordered for trial and evaluation as basic trainers. It is widely believed that the employment of jets from the start may bring about a reduction in certain kinds of accidents at later stages of training, because these accidents are possibly caused by applying earlier-learned piston-engined practices or habits to advanced jet aircraft for which they are unsuitable.

The foregoing remarks will serve to emphasize that one of the most important decisions to be made by an air force, or by the designer of a jet trainer, is upon the part the machine should be able to play in the training programme: at what hours will it take over, and how far can it get the pupil before having to hand over to the next machine? Jet Provost to Vampire trainer to an as-yet-non-existent operational trainer (such as a two-seat Swift or Hunter) would seem to form a logical sequence for the R.A.F. But other countries have slightly different ideas, and it remains to be seen how many variations will be tried and how many will be successful. It has still to be proved that the admittedly extravagant course of teaching a pupil to fly on a relatively powerful basic jet will be worthwhile and a practical proposition. The batch of Jet Provosts have thus been ordered, one might say, to assess *reacteur* reactions.

A very promising French jet trainer, with which this account is concerned, is the Fouga C.M. 170 Magister, which has two Turboméca Marboré 2s, giving 880 lb thrust each. The French regard it as a basic and intermediate trainer, but accept the fact that a pupil should do a few hours of grading and elementary instruction before being passed for continued training on the 170. This is not at present the R.A.F. intention in the case of the Jet Provost. At the upper end of the scale the Fouga 170 has more performance, however, and it is to be cleared for 430 to 450 kt limiting speed. It is capable of 440 m.p.h. in level flight, and has a ceiling of at least 35,000ft.

The Fouga does not have ejector seats, but the possibility

*M. Grangette briefs the author on the layout of the rear cockpit. The 170 sits low on the ground and is easy to get into. The binocular periscope can be clearly seen.*

## FOUGA C.M. 170 IN THE AIR . . .

of fitting one of the new lightweight designs is being considered in case this should be asked for.

Readers may recall here, for comparison, the characteristics of the Fokker S.14 described in our issue of January 15th. This machine could take over at much the same point as the 170 and can carry the pupil up to and just beyond the 170's (and perhaps the Vampire Trainer's) top stages, but by comparison with the twin-jet Fouga 170, which is quite tiny, weighing 7,000 lb at maximum a.u.w., the S.14 scales over 12,000 lb and uses the 5,000 lb thrust of one Rolls-Royce Nene. Here, obviously, are a number of variables to be compared and contrasted.

The French are talking in terms of the following training stages: 20 hr grading and selection on light club type; 40-60 hr on something like the T-6 or Morane 733; 120-140 hr on the Fouga 170; 15-20 hr on the T-33 or Meteor; then over to the current fighters, F-84, Vampire and, finally, Mystère and Hunter. The Fouga company believe that their 170 could be phased-in at about 50 hr and continue through about 70 per cent of the instruction period up to a total of 190-200 hr.

That the little French trainer (I did not once hear its original name of Magister used at the makers' works at Toulouse) has much to offer is already being recognized by authorities other than the French Government, who have ordered a total of 107 of them (two prototypes, five pre-production and 100 series production). The machine has a tapering wing of 7.4 aspect ratio, with 19 per cent t/c ratio at the root and 12 per cent at the tip. The leading-edge sweep angle is 13 deg and the wing loading is about 38 lb/sq ft.

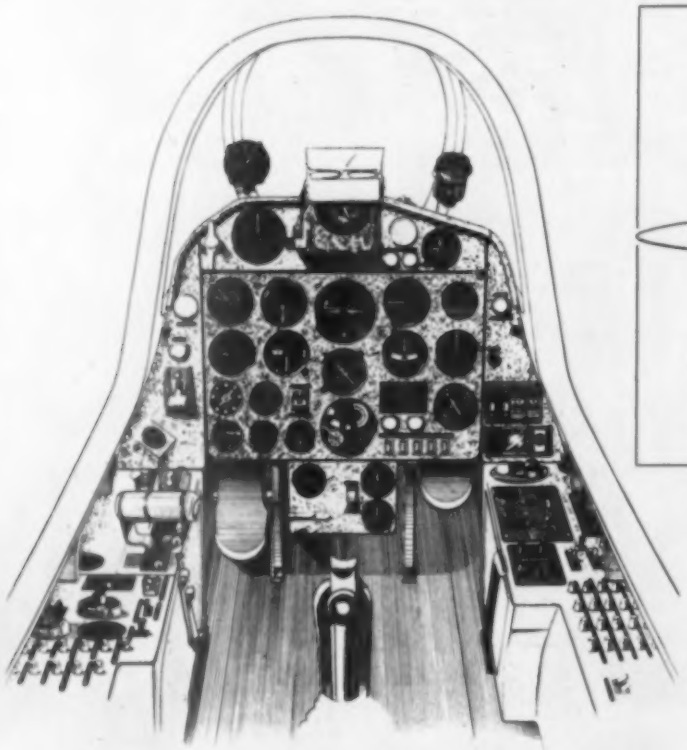
Its principal characteristics are twin-engine safety with single-engined flying characteristics: small size with the performance usually only to be found in a larger, more powerful aircraft; tandem seating (the pilots fly on the centre line); 110 deg butterfly tail; full radio and armament equipment; and undeniably attractive appearance.

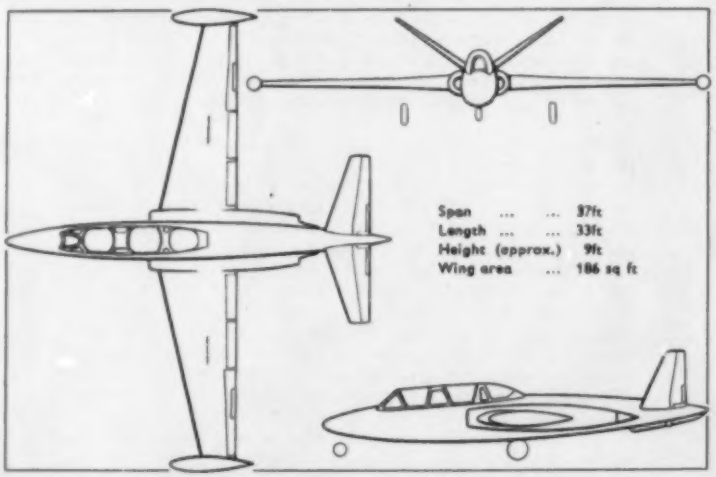
Accessibility of engines and equipment for servicing is unusually good; for example, either or both engines may be changed in 45 minutes. The price, fully equipped, is equivalent to £35,000. All the cockpit side panels for electrics and radio will conform with NATO standards and are designed to be removed *en bloc*, connections being in plug form.

No alternative power unit has been considered for the 170, but it will be recalled that an American company has bought the licence for the Marboré The two engines are tucked in close to the centre line and singly produce very little asymmetric thrust effect. The first prototype, numbered 03, has a slightly different mounting for the engines and the jet-pipes are kinked and toed out. The second machine, 02, has the engines lined up exactly fore and aft and the airflow is straight through. As a result, the width across the "reactors" is slightly increased and some work on deflectors (see photographs) has been called for to prevent the straight-back efflux overheating the skin of the tail cone.

The overhaul life of the Marborés is not yet settled, but one unit has now reached 130 hr in one of the 170s without replacement. The two prototype aircraft had flown 230 hr and 40 hr respectively at the time of my visit.

Several other minor differences may be noted between the prototypes, and others will be apparent on the produc-






*Slim lines, butterfly tail: general arrangement of the C.M. 170.*

*The Fouga's front cockpit shows a neat layout. Above the main panel is the gyro gunsight, with machmeter and accelerometer on either side; above the coaming are the clock and stand-by compass. Engine, flap, air-brake and undercarriage controls are on the left; control-panels for the radio equipment on the right.*

*(Right) The liveliness of the C.M. 170 is made vividly apparent in this picture of the second prototype. Note the keel and wheel under the tail.*

*(Left) This was the first occasion on which the two Fouga prototypes had been photographed together in formation. The pilots were M. Grangette—who is now the company's chief test pilot and who flew with the author—and M. Bourrieau, who has made the first flights in all the company's previous light jet aircraft.*

tion machines. For example, at present provision is made for two 7.5 mm guns in the lower portion of the nose. On production aircraft these will be raised, and provision made to collect links and cases. Each gun is provided with a 200-round ammunition box. The aircraft can carry, in addition, four rockets or two 110 lb bombs under the wings. On the day before my visit the 170 had been flown for the first time with rockets attached. Neither guns nor rockets had yet been fired.

The first production aircraft will begin to appear early next year. The fuselages, including the cockpits, will be made by S.N.C.A.S.E., the wings by Morane, and the nose and tail sections by Fouga at Aire Sur l'Adour. Assembly will be at Toulouse, in a new hangar which is to be built near to the existing control tower on the opposite side of the airfield from the present premises. A full-production rate of six aircraft per month is foreseen.

Any export orders received will, it is said, take priority over the French Government order, and later on this might amount to buying "off the line" with little or no delay. Italy and Japan are said to be among the countries interested in the 170. Both NATO and Boscombe Down pilots, I was told, have evaluated it in the air with complimentary results.

To obtain my own first-hand experience of the 170 I had travelled to Toulouse in company with a cheery crowd assembled by Jacques Noetinger of Informations Aéronautiques, Paris. Breakfast at Toulouse, after a night on the train, found the test pilot and observer, a radio commentator, photographer, the organizer and myself planning the day's flights. I was given first turn, and the photographer was to perform after lunch.

We drove to the airfield in pleasant, misty morning sunshine and, after some briefing on the two cockpits and their instruments and items of equipment, I was eased into the rear cockpit. The levers, switches and dials are easy to see and use, and there is just comfortable room for pilot and parachute. I was required to don a Lombard helmet, the tightness of which later caused me some discomfort and overheating. Pedal-reach adjusts without limits—I needed full stretch for comfort, so a taller man might find his knees well up. Seat height can be adjusted in the usual way.

One advantage of a small, low machine is the ease with which one can climb in. The Fouga's cockpit "lids" open up and backwards, and one faired step about 18 inches up is all that is needed to get in. Pressure is to be provided soon, but we had to be content with oxygen alone.

Once I was strapped in and the lid had been closed I watched the starting procedure and received information over what seems to be a very clear and interference-free intercom.

The machine carries two V.H.F. sets (one main 12-channel and one three-channel for emergency), Lear radio compass, and the intercom. All may be switched on together and brought in as required by one or more of four matched volume-controls. The light-weight Lear compass has not proved altogether satisfactory in the 170 and is to be replaced by a rather heavier French-licensed and modified Marconi.

The cockpit layout, which in its essentials is the same front and rear, is to be altered a little for production but is near enough to finality to justify description. The standard blind panel is ahead of each pilot, and engine instruments are to the left. Beside them again, and on the left "bench" panel, are the undercart lever, flap indicator, flap switch, their emergency selectors and the pair of throttles, one of which carries the air-brake switch and the gun-sight twist-grip. Lower down on the port side are the twin fuel cocks carrying lighting (or relighting) buttons. Under both elbows are the electric relays. The right forward bench carries the radio panel, and on the extreme right of the main central panel are the armament switches and controls. The oxygen regulators are forward of the stick, low down. The other switches (battery, pitot heat, gyro compass, etc.) are placed in the remaining space on the main panel. The front fuel gauge will be positioned so as to be visible to the instructor in the rear seat. Synchronized Mk 4 gyro gunsights fill much of the space in front of each pilot's head. Only the essential controls are repeated in the rear cockpit. The front cockpit is illustrated with the new, larger shock-proof panel.

The instructor in the rear seat does not see very much directly ahead, but his view is to be improved by bulging the front screen a little more. Of special interest is the binocular periscope provided for the rear seat. This gives a clear and accurate view, with quite wide angle and adequate perspective, straight ahead over the top of the front cockpit. Only experience of several hours could show whether safe landings could be made with periscopic aid alone. The answer might well be of interest to people other than rear-seat instructors. The device might also be useful on some aircraft for looking backwards. Certainly this equipment is worth-while on the 170.

In the extreme nose of the machine will be carried a landing light, and on the Messier nosewheel (to be fitted after No. 5 machine) there will be a retracting taxi light.

Only the very minimum of drills and procedures are required before take-off. Starting-up is achieved as follows. With master switches on and throttles closed, select port on the two-way starter switch (moving in logical sense); when r.p.m. reach 1,500, press light-up button on port fuel cock and open cock at the same time; keep pressing until about 2,500 r.p.m. is showing; then switch off starter switch and open up to idling at 6,000 r.p.m. If starting on the Fouga's own batteries, open up the port engine until the generator warning light goes out at around 12,000 r.p.m, then repeat the procedure with the starboard engine. On the ground, the Marborés emit a penetrating, high-pitched squeal.

Before taxying, one checks temperatures and pressures

*By any standards the C.M. 170 Magister tandem twin is an attractive little aircraft. Its performance on training duties will be watched with great interest.*

## FOUGA C.M. 170 IN THE AIR . . .

and exercises flaps and air brakes. The demonstration of taxying which I experienced was rather exciting, to say the least of it. The long taxi-tracks at Blagnac have the usual curves, and these we rounded at about 50 m.p.h. There was no question of protest or risk, because the 170 is very low on the ground and has an exceptionally wide track and long wheelbase—12ft 6½in and 14ft 9in respectively; there can scarcely be a more stable machine for ground handling in the world than this Fouga. Even so, this sort of procedure goes against the grain for a one-time Stirling pilot. Incidentally, pupils growing accustomed to high-speed taxying will have to watch their handling of other aircraft, even though fast taxying, within reason, is usually a good thing with jets.

Take-off is a simple performance following a check comprising: tail trimmer zero, pitot heat on. I have no doubt that C.F.S. would find a lot more to check before take-off, but these two items sufficed for my Fouga flights. The details of take-off I shall give after a word on the brief demonstration flight, following which I moved into the front cockpit. I took in less during the demonstration than I had hoped because my Lombard helmet proved to be even tighter than I had thought, and quickly caused me quite a lot of discomfort and overheating.

The cockpit has a fresh-air system; but it was not used, because of the noise it causes. Without it the cockpits are quiet and only a distant whine speaks of turbine power somewhere aft. The view out on either side of the narrow cockpit is excellent. Both seats are ahead of the wing leading-edge. The take-off run was about 1,500 yd.

When we were airborne and had climbed for a while, the very marked effect of the air brakes was demonstrated to me, as was the effortless series of aerobatics which can be tackled all at cruising r.p.m. and without loss of height. A motor was cut and relighted, and this served to show the excellent single-engined performance and ease of relighting. There is at present some burbling through a stopped engine. Relighting, carried out at about 160 kt, is practically instantaneous. At speeds of more than 180 kt it is hardly possible to detect the absence of thrust on one or other side. There is no doubt that this sort of twin power installation is good and offers distinct safety advantages—not that turbojets make a habit of stopping. A test flight was recently made on which only one motor was started.

After some 35 minutes we returned to the apron, topped up the fuel tanks and changed my helmet; then we prepared for a second flight in which I was to sit in front and do the flying. There seemed to be slightly more room in the front cockpit, although dimensions show this to be no more than impression. The rudder reach can, I believe, be adjusted to suit a longer leg in front. The starting procedure was as already described, and without delay I released the parking brake and taxied out.

I can give no true indication of control on the ground because the brakes and undercarriage on 02 are not standard. The brakes are at present too abrupt on the prototype in which we were flying, and only with difficulty could I prevent the taxying from becoming a jerky, zig-zag performance. Even the rudder pedals are not as they will be, and it was necessary to place one's feet high to operate the rocking-type toe brakes comfortably. But such points are easily rectified, and I have no hesitation in saying that, with the small changes envisaged, the Fouga will be pleasant to control on the ground for the reasons already mentioned, namely, low c.g., wide track and good view.

Permission was given by radio to back-track up the long runway at Blagnac, and we taxied at high speed to the take-off point. I lined up, put the trimmer at neutral, turned on pitot heat, and then opened up to maximum r.p.m. of almost 23,000 against the brakes. The jet-pipe temperature was comfortably below the maximum of 650 deg C.

On release of brakes the machine surged forward without any tendency to swing, and it seemed to me that some effect could be obtained from rudder movement at no more than 40 to 50 kt. At 60 kt I raised the nosewheel, an action which gives a marked feeling of attitude-change. At about 85 kt —still accelerating quite rapidly, though not in a way comparable with, say, the take-off of a Vampire or Meteor—an extra small backward movement got us airborne. The stick handles nicely but the pilot must use it mechanically rather than with delicacy of feel.

Neither the speed build-up nor initial climb is particularly rapid as jets go, but they indicate a very different performance from that of, say, the Harvard. There is plenty of time to retract the wheels before the maximum wheels-down (and flaps) speed of 140 kt is exceeded. Flaps are not recommended for take-off.

The time allowance for maximum power is 15 minutes, so there was no need to throttle back and, when the correct climbing speed of 220 kt had been gained, we went on up to about 10,000ft at a climb rate of nearly 3,000ft/min. The maximum measured climb at sea level is 3,300ft/min.

Having throttled back to 20,000 r.p.m. (max. continuous is 21,000 r.p.m., giving 705 lb static thrust), I allowed a few seconds for the speed to build up to 250 kt I.A.S. Acceleration is not very marked. One would not, perhaps, expect it to be so in a comparatively low-powered jet aircraft; but once you "get mowing" the cleanness of the 170 is apparent from the way she hangs on to the speed.

At this time we had an entrancing view of the sharp, snow-covered peaks of the Pyrenees seventy to a hundred miles south of us.

The ordinary handling in turns and so on calls for no comment. The controls are sweet and well harmonized and just about as light at 250 kt as I like them to be. Without prior knowledge of the fact there would be no way of telling from feel or response that a butterfly tail is fitted.

A conventional tail has, in fact, been tried out, but it brought no worth-while improvements and proved inferior aerodynamically at high Mach numbers. The purpose of the keel fitted under the rear fuselage is to reduce the dihedral effect of the butterfly tail when rudder is applied. When this was added a small tailwheel was also adopted in place of a bumper. Both from appearance and from the pronounced change of ground-angle experienced by the pilots when the nose is raised for take-off or landing, it could seem that this tailwheel might be required to give frequent

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## FOUGA C.M. 170 IN THE AIR . . .

service; but in practice this does not seem to be the case. The tailplanes-cum-fins are, of course, non-moving. They are fitted clean, without fairing or fillet.

To return to the flying, the aircraft is very stable laterally, and with the use of the tail-trimmer—operated by a rocking switch on the stick—it can be trimmed to fly hands off indefinitely. Directionally it is stable enough, though less so than about the other axes. In a gentle dive to 320-340 kt at 5,000ft the ailerons heavy-up considerably, but elevators remain about as at other times and there is very little trim-change.

At the limiting Mach number of 0.8 there is an appreciable change in stick force and the ailerons are about solid. I was told that if the aircraft is trimmed level at 0.65 at 30,000ft a push force of about 14 lb is required to hold a steady dive of 0.77. By 0.8 this has changed to about 9 lb pull.

Quite a lot of work has been done on the ailerons, and a little more remains. On the early flights the ailerons were both heavy and rather ineffective. The tail controls, on the other hand, were over-powerful and light. To correct this, the movement of the tail surfaces had been reduced, I was told, from 18 deg to 11 deg. The rudder has been slightly spring-loaded and the ailerons given increased tab-area and more angular movement.

The air brakes are operated by a rocking thumb-switch, mounted on the starboard one of the pair of throttle levers. They can be inched in or out and open transversely towards the fuselage, penknife-blade fashion. The action is quick, say 1½ seconds to full out, and the inching control should be very useful for formation work. At first two rows of surfaces like miniature tank-traps were fitted above and below each wing at about mid span. This arrangement had worked well on early Fouga light jets, but on the 170 it proved excessively powerful; now, after progressive modification and testing, single rows of teeth have been found to be suitable, and even these are no more than cut-out frames.

**C.M. 170: A TYPICAL MISSION**

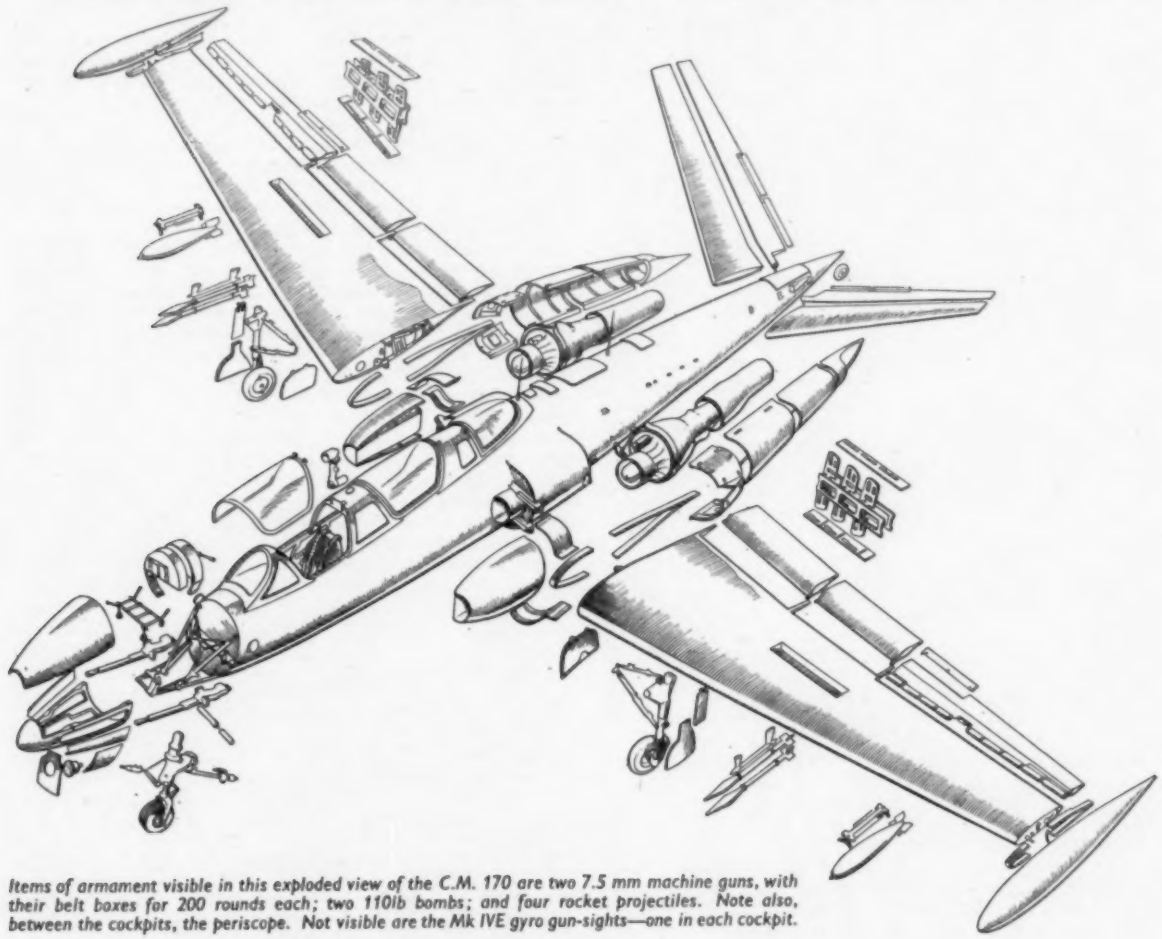
| Phase | Conditions | Consumption (U.S. gal) | Duration* (min) | Distance* (miles) |
|---|---|---|---|---|
| Taxying ... | — | 5 | 5.0 | — |
| T.O. and climb | from s.l. to 20,000ft at 22,600 r.p.m. | 36 | 9.5 | 60 |
| Level flight... | at 20,000ft and 21,000 r.p.m. | 122 | 56.5 | 357 |
| Descent (with airbrakes) | from 20,000ft to 2,500 ft with engines fully throttled | 3 | 1.5 | 8 |
| Holding ... | at 2,500ft | 18 | 10.0 | — |
| Taxying to hangar | — | 5 | 5.0 | |
| Fuel remaining | — | 3 | — | — |
| | Totals ... ... | 192 | 1h 27m 30s | 425 |

* Figures in this column are not maximum performance values.

In flight the air brakes may be operated under any condition of speed, load or altitude. The pupil will be told: "when in doubt, put 'em out." The production aircraft will carry an emergency system for air-brake operation. The stopping effect when they are extended is marked: there is no trim-change, but a slight vibration is felt through the airframe. The air brakes are normally used for both approach and landing.

Emergency operation of flaps and undercarriage is by the use of a selector and a hydraulic hand pump. The emergency flap system is to be omitted in future, but the dive brakes will have an emergency system.

The normal internal fuel-capacity of the machine is 192



*Items of armament visible in this exploded view of the C.M. 170 are two 7.5 mm machine guns, with their belt boxes for 200 rounds each; two 110lb bombs; and four rocket projectiles. Note also, between the cockpits, the periscope. Not visible are the Mk IVE gyro gun-sights—one in each cockpit.*

*Taxying out from the company's apron at Blagnac, Toulouse. Note the dive brakes and the fact that the tip tanks have been removed.*

## FOUGA C.M. 170 IN THE AIR . . .

U.S. gallons, but tip (not drop) auxiliary tanks will now be provided as standard equipment, and these hold 34 U.S. gallons each. The tanks will be cleared without limits on completion of current tests. At present a speed limitation of 350 kt I.A.S. with tanks is being observed, and also a roll rate of 8 sec round. Without tanks the maximum rate of roll is moderate for the type—nearer 4 sec for 360 deg. The speed now permitted is 400 kt I.A.S., and this is to be raised in a week or two to 450 kt. The airframe is cleared for 5g at full load. Indicative of fuel consumption and endurance is the typical mission quoted by the manufacturers and tabulated at the top of the previous page; general performance data are given below.

The two Marborés have a single common fuel-system but their oil systems and tanks are separate, because it has not been found possible satisfactorily to balance the engine demands if a single tank is used.

After getting used to flying in the front cockp. , I decided to try a roll each way. This sort of thing the Fouga takes in its stride. A slight raising of the nose at any speed above 200 kt, stick over, and round she goes as sweetly as anyone could want. Coming out, a fair amount of rudder may be needed.

I did no more g-giving aerobatics because, frankly, a sleepless night in the *wagon lits* from Paris to Toulouse (truly steam transport, though as good of its kind as anywhere else), the tight Lombard of the earlier flight (which included some aerobatics and a shoot-up), a delicious but rich French dinner the night before, too much clothing and the brilliant sunshine, had all combined to make me feel a trifle jaded.

Obviously, stalling could not be evaded, so I had a good go at it, both clean and with wheels and flaps down. Short of hauling the nose high in the air it took a long time even with air brakes out to get the speed down. Gentle warning buffeting is felt about 10 kt in advance, and the controls—especially the ailerons—retain some effect until the last moment. The nose waffles down more or less straight, and if you jockey with the stick the aircraft eventually drops a wing fairly smartly. Recovery is, however, instantaneous and very little height is lost. The stall varies only in speed, not character, when wheels and flaps are lowered. The I.A.S.s for the stalls, at 5,000ft, were about 78 kt and 70 kt respectively. Tiny knife-edge spoilers, no more than 6in long, fitted on the leading edges at mid-span have, I was told, turned a sudden wing-dropping stall into the gentler performance described.

All spinning trials have been carried out on the Fouga and I was informed in Paris that this was one reason for the adoption of the aircraft instead of its side-by-side rival, the Morane, which apparently has not yet spun satisfactorily. The two Fouga prototypes each spin differently and, in addition, they spin differently to the left than to the right. Recovery is quite positive, however, and on the average takes half a turn. I was told that the spin is smoother and recovery action more consistent if the wheels and flaps are down.

For a trainer, landing characteristics which are both representative yet simple are desirable. I made a couple of landings, neither of which was particularly good. The reason was, I believe, that I tried to treat the 170 as if it were a conventional light aircraft with flexibility and feel, rather than as just a small one. In fact, it has jet-fighter characteristics and the technique is to arrive by aiming at the touch-down point, using the now-becoming-time-honoured glancing-blow technique. If there is much extra approach speed above the minimum for safety, the cleanness of the aircraft results in a long level period.

Starting at 2,000ft, I cut back on the Marborés and put out the dive-brakes. The speed slowly came back to 180 kt during a wide initial descending circuit of the airfield. On levelling out the speed slowly dropped again to 150 kt and I could put down the wheels. The green warning lights gave the O.K. for locked and a dim red light, fitted instead of a warning horn, stopped blinking at me.

I could now increase engine r.p.m. and still keep at about 130 kt. The short, thin-wheeled Hispano landing gear produces little enough drag. The flaps can be inched down with the aid of the fore-and-aft two-way selector switch. The lowering of neither flaps nor wheels produces any appreciable trim-change.

I turned in at 110 kt, which was rather too fast, and approached at just over 100 kt—which also proved to be too fast. A little backward trim helped at this point. The rate of descent with engines near idling and a medium wind was now quite rapid, and the nose seemed to be a little up, so I piled on some extra thrust for a few seconds and then cut and held off at what I judged to be about 3ft. After a long level period—not really a float—we touched down firmly and, it seemed, with the wheels about 2ft below the runway. It will take a little time for pilots from other aircraft to realize how low the Fouga is on the ground. The aircraft was pleasantly steady after touch-down, and it did not occur to me at once that the nosewheel was still high off the ground. I tried lowering it a little, and in my surprise at how far down it had to go I put some weight on a toe brake, causing a momentary sharp lurch to port. This was easily corrected, and I admit to the fault here only to illustrate that the machine is most controllable on the landing-run and, of itself, has no tendency to swing or bounce.

On a second circuit and landing I made the approach more slowly and checked at no more than 90 kt. The wait before touch-down was then shorter and the aircraft landed well enough in the approach attitude and again bowled smoothly along, nose high, until the stick was eased forward.

The last part of the run was shortened with the aid of the powerful brakes, which can safely be used heavily if need be.

From the pilot's point of view, the Messier landing gear which will be fitted to production aircraft (it is now being tried on 02) will probably feel very little different. The tyres are of bigger section and will be satisfactory for operation from grass. They will probably produce a little more drag and they weigh more. An anti-shimmy nosewheel tyre is also to be fitted, although I did not hear of any instance of wheel wobble.

There is little doubt that the 170 will be liked as a flying machine; only experience can show its training qualities.

**FOUGA C.M. 170**

| Performance:— | Without External Stores* | With Extra Fuel Tanks† |
|---|---|---|
| Max. speed in level flight at s.l. | 423 m.p.h. | — |
| " " " " 30,000ft | 444 m.p.h. | — |
| Max. rate of climb at s.l. | 3,350ft/min | 2,925ft/min |
| " " " " 30,000ft | 980ft/min | — |
| Time to 30,000ft | 16 min | — |
| Actual ceiling (r.o.c. 200ft/min) | 40,000ft | 34,000ft |
| Take-off run | 1,800ft | 2,150ft |
| Distance to clear 50ft | 2,600ft | 3,100ft |
| Range at 30,000ft with 32 U.S. gal. reserve | 570 miles | 750 miles |
| Duration at 30,000ft with 32 U.S. gal. reserve | 1hr 55min | 2hr 40min |
| **Weights:—** | | lb |
| Airframe | | 2,716 |
| Engines and equipment | | 886 |
| Tanks, accessories, etc. | | 666 |
| Empty weight | | 4,268 |
| Maximum permissible weight | | 7,055 |

*Average t/o. weight, 6,280 lb. †Average t/o. weight, 6,830 lb.

# THE HELICOPTER COMES TO STAY

## *Bell Chief Looks Back—then Forward to a Bright Future*

*Lawrence D. Bell, Founder and President of Bell Aircraft Corporation*

**THIS exclusive contribution—racy, enthusiastic, confident—is by Mr. Lawrence D. Bell, whose name needs no introduction. It was originally intended for inclusion among other messages from leading rotorcraft authorities in our special Helicopter Number, but did not arrive in time. We present it here, as being well worthy of a page in its own right.**

DESPITE its comparative youth, the helicopter has made amazing strides since it was licensed commercially less than ten years ago. Today it is an accepted aircraft in many countries throughout the world, performing its daily assignments in commerce, industry and the Services without fear or favour. Because it is such an unusual and adaptable aircraft, we like to feel that the utility of the helicopter is limited only by man's imagination. Proof of that, of course, are the new tasks which are being added to its repertoire almost daily.

Frequently, we in the helicopter industry are called upon to take a look ten, twenty and even fifty years ahead to try to predict what the future holds for this versatile aircraft. That's not easy to do, any more than it was simple for aviation men to gaze into the crystal ball just after World War I and see the fast, huge aircraft and the economically important industry which came out of World War II.

When our own helicopter became the first to be licensed by the Civil Aeronautics Administration in 1946, we knew we had a wonderful machine. It could take off or land vertically, fly sideways, backwards or forward. The next thing was to put it to work.

Most machines are born of necessity. I'm not sure this was the case with the helicopter. Man wanted to be able to fly like a humming-bird, so he set out to perfect the aircraft that would permit him to do it. Its more obvious attribute was apparent: it needed no runways; it could operate from an area not much bigger than the diameter of its rotor. Facing up, then, was the job of putting this utility to good use.

As the first step, we took a look at agriculture. There was a need, we felt, for an aircraft which could fly more slowly than the conventional fixed-wing crop-duster and, as a result, do a more thorough dusting or spraying job. We equipped the helicopter with dust hoppers and, after the expected experimentation, proved that here was a field in which it excelled. I am not at all sure that we realized fully the benefits to be derived from the rotor downblast.

At any rate, the orders began to come in, slowly at first and then more rapidly as the aircraft proved itself, both practically and economically.

Then we looked around some more. The high-tension powerlines offered an interesting possibility. Could we patrol them with the helicopter, faster, more efficiently and economically than they were being patrolled on foot? We tried it and we did it. Today the helicopter is an accepted piece of equipment with many big power companies.

That's the way the helicopter grew and, I feel, we can be justifiably proud because of the exploring and experimenting we did, almost always at no profit to us.

About the same time we were doing these things in the commercial field, the military became interested. True, helicopters had been used during the war by the Navy, but little investigation had been done by the other Services. A few machines were ordered, but the real value wasn't realized. They were tried on various tasks, but I am afraid they were looked upon almost as a luxury.

It took the Korean war to establish the helicopter firmly in military planning and operations. It was proved as a practical vehicle of mercy and its use provided an impetus that could have been obtained in no other way.

There seems to be little question that its contributions in Korea, where it helped to reduce combat mortality to less than two per cent—lowest in history—cut at least ten years from the industry's anticipated time schedule for development and recognition. More important than this consideration, however, is the fact that many thousands of badly wounded soldiers owe their lives to the efficient, safe and rapid evacuation from front lines to field hospitals. Frequently a man was on an operating table within ten minutes.

As was to be expected, the fame achieved by the helicopter in Korea aroused great commercial interest. Operators and would-be operators were figuratively pounding down our doors trying to get delivery. But the military requirements had to come first. As soon as it was permitted, however, we began to produce a few for commercial use and now, of course, we are turning them out as rapidly as we can.

It has been interesting to me to see their utility grow within just the last few years. Our helicopters are hauling men and equipment high into the mountains of British Columbia to speed a half-billion dollar power-plant and smelter construction project for the Aluminium Company of Canada. They are turning months into hours and years into days, doing a job that could be done in no other way. They're patrolling New York Harbour for the police, effecting rescues where lives otherwise would be lost. They're carrying mail in Chicago and Belgium. They're serving as the eyes of ice breaker supply ships far up in the Arctic and searching out lost cattle amid the tangled mesquite of the great South-west. These are only a few of the fascinating assignments they have accepted in stride, looking all the while for more.

But let's look at what is to come.

Certainly the day of "a helicopter in every garage" is not close. There are too many complications, not the least of which would be traffic control. A helicopter can't be flown as easily as one can drive a car and, for the present at least, you can't buy maintenance at the corner gasoline station. That will come, though. I don't believe the means of propulsion will be with the conventional reciprocating engine. Jet propulsion in some form may be the answer.

Certainly, too, the helicopter has a vital rôle in short-haul transportation. Today it isn't economically ready. Costs are just too high. But that is true with almost any kind of a short-haul transportation. Per-mile operating costs go down as more miles are flown.

The big helicopters are here and they will grow in operating economy and efficiency with the need. The time will come—and relatively soon—when these versatile aircraft will eliminate the long and aggravating trip to the airport. They will be landing on downtown buildings—just as they are in New York and other metropolitan communities today—and they'll be shuttling passengers into airports from 100 to 200 miles away for the fixed-wing airplanes to carry them on the longer flights. This job may be done by the convertiplanes.

They will pay their own way, too, but it won't be in the next ten years. They will be a convenience at first, probably subsidized by the airlines, but the time will come when they may be turning a profit.

We have come this far in less than ten years, so just give us a little time—and plenty of support—and we shall produce the results.

# LOW-LEVEL BOOMING

## *The Sonic Shock-wave as an Offensive Weapon?*

VARIOUS theories have been put forward as to the effects of sonic shock-waves aimed at the ground, particularly in relation to their effect on human beings, animals and buildings. When the first sonic booms were made in this country by the Hunter, Swift and D.H. 110 there was a series of reports of minor damage caused on the ground. Yet, though the noise was certainly distinctive, and even alarming to people not expecting it, the destructive power of the shock-wave was soon proved almost negligible. The booms originated at high level and aimed at the crowds at Farnborough last year found their target but produced nothing more than enthusiastic interest, as was the intention.

The subject, however, appears in a very different light in an article published in our American contemporary *Aviation Week*, where William J. Coughlin quotes some of the results and theories arising from flight tests of the North American F-100, the first operational aircraft capable of exceeding Mach 1 in level flight near the ground. The first public demonstration of the destructive power of sonic shock-waves was given when the F-100 was shown to Pressmen at Palmdale, California, last October. On that occasion the aircraft made a very fast, low pass at 200ft near, but not directly over, a U.S.A.F. administration building. Window- and door-frames made of 4in by 2in and 4in by 4in timber were shattered, and slivers of glass several inches long embedded in the walls of rooms inside the building. The journalists were impressed. Coughlin states that "anyone who observed the Press demonstration of the F-100 . . . would agree to the potential value of a shock-wave as a possible panic weapon."

The damaged building at Palmdale was evidently a wooden-frame structure of the type common in America. The major effects of sonic shock-waves are probably confined to damage to relatively weak structures, including humans, and to the causing of panic. But effect there is.

Due to the difficulty of radar-tracking aircraft flying low down at supersonic speed, the first warning of the presence of such an aircraft would probably consist in the sudden impact of its shock-wave. Coughlin quotes Raymond H. Rice (vice-president and chief engineer of North American) as saying that such waves may, in the not-too-distant future, be expected to attain an intensity of 50 lb/sq ft—equivalent to the instantaneous arrival of a 140 m.p.h. hurricane. The blast would be short-lived, but its shock and oscillatory qualities, not to say the element of surprise, would be considerably greater than that of a hurricane.

North American spokesmen have gone as far as to lay down some desirable qualities of a future "fighter-boomer." Ideal speed for best effects is stated to be Mach 1.2 to 1.5; the aircraft should have as large a cross-sectional area as possible, consistent with its ability to achieve the desired Mach number. Since its shock-wave would be its only weapon, it would need to carry no offensive stores, and its radius of action would therefore be considerably greater than that for a comparably armed fighter-bomber.

George Welch, the company's senior engineering test pilot, reports that he has flown the F-100 past an F-86 at well over Mach 1 without any adverse effect on the latter—the F-86 pilot "didn't feel anything." North American consider that a fabric-covered airframe, on the other hand, would be split open by the shock-waves if the F-100 passed close by. For safety's sake the F-100 is not allowed to fly supersonically within 5,000ft of private aircraft or airliners, nor are level supersonic flights permitted below 10,000ft; and sonic dives are forbidden within 15 miles of any inhabited area.

There is, however, thought to be little danger of irresponsible low flying in sonic aircraft when they come into service. Raymond H. Rice is quoted as saying "Lest I cause some to worry unnecessarily about low-flying friendly aircraft, it should be understood that low flying at supersonic speed takes a great deal of pilot skill and advance planning. It is almost inconceivable that this could ever be done inadvertently, and it is certain that irresponsible people would never be permitted to control such machines of destruction."

Après moi le déluge: *from such a height as this the "fighter boomer" might trail its wake of destructive shock-waves over a suitable target.*

The various opinions quoted above suggest some fairly simple conclusions. Though the destructive power of the sonic shock-wave is considerable, it would probably be ineffective against robust targets. Its surprise-value, also, must be offset by the fact that it would be extremely difficult to maintain any form of continuous bombardment. A stream of aircraft "bombarding" a target would run into one another's slip-streams, and a single machine would require some time to turn full circle and return to the same spot. Supersonic low flying in hill country would probably prove exceedingly difficult, if not more dangerous to the pilot than to his target. Yet a sonic shock-wave, well directed, might serve to remove flimsy camouflage from small, well-concealed targets. In arctic areas, moreover, a "bang" might remove windows and doors from living quarters, rendering them uninhabitable by exposing their inmates to the bitter climate. Windowless or doorless hangars might also become too cold to allow maintenance work with bare hands on delicate equipment.

In the type of attack carried out on airfields during low-level sweeps of World War II, the fighter could make one only very fast pass over an airfield, relying for success on the element of surprise. It was highly dangerous to return for a second attack, because the defences would by then be alerted and prepared. During that one fast pass the pilot had to pick his target and manœuvre his aircraft to fire, all in the space of a few seconds. An aircraft travelling at sonic speed, on the other hand, would now merely have to fly straight over the airfield under attack, with some certainty of achieving surprise, and trail its wake of shock-waves over the area, probably with considerably greater effect than a hasty spread of cannon shells.

Whatever the future applications of aimed shock-waves may be, the introduction of safety regulations covering sonic flying indicates that a new problem is emerging. Recent references in Parliament to future British aircraft capable of level supersonic flight may herald the occurrence here of phenomena similar to those experienced in the case of the F-100, and of the introduction of comparable regulations to minimize the effects.

# CORRESPONDENCE

*The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.*

### "Frustration"—from Canada

WITH the biennial recruiting campaign for British Aircraft technicians about to commence, I should like to point out some of the snags which are likely to be met in the Canadian industry by would-be immigrants.

The reason for its being a biennial affair is that technicians are brought to Canada on a two years' contract; and, due to losses of personnel—for reasons such as those explained below—the stocks have to be replenished. Britain, unfortunately, is made scapegoat, the average American being on a much higher salary scale.

Regarding senior men, frustration regarding promotion is a real thing here. Vacancies for section chiefs are filled by Americans or Canadians; the necessary experience, qualifications and organizing ability in most cases are considered superior to those of the British engineer.

Junior men are "hired" for production modification work, and the chances of design work are extremely remote. These conditions cannot be remedied by moving to another firm, as the two main aircraft firms have an employee tie-up. Hence the drift south to the U.S.A., or back to England. Salaries which appear huge in England are very ordinary on arrival here; a comparison is one English pound to nine Canadian dollars *minimum*—i.e., a salary of £14 in the United Kingdom is equivalent to 126 Canadian dollars.

The way of life is very different, and I personally feel there are much better things in life than washing machines and Yankee cars.

P.Q., Canada. DISAPPOINTED.

### Scramble for Seats

ALTHOUGH B.E.A. obviously arrange most things well for the comfort of their passengers, one important matter seems to have been overlooked; that is the booking of seats.

The seating accommodation is limited and presumably no harder to arrange than that of a railway carriage.

On a flight to Zurich last year I saw an undignified rush of passengers across the landing ground to the plane in order that members of families could sit near one another. At Zurich, on the return journey, it was worse; elderly and polite travellers were left in the rear of the stream from the waiting-room to the plane. Wives who had little experience of travelling, and were obviously nervous, were separated from their husbands; and so on.

Hostesses do their best but they cannot be in a position to meet all requests with the time at their disposal. The jostling of British passengers was not an edifying spectacle to display in a foreign country.

Esher, Surrey. H. S. TOOGOOD.

### Cierva Autogiro Recollection

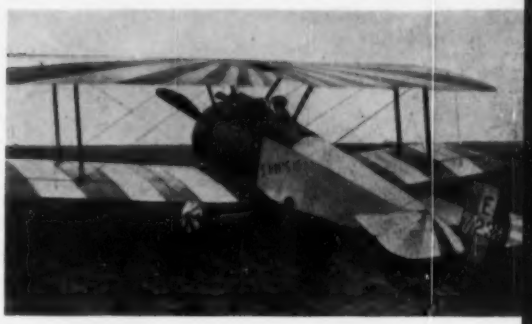
AFTER reading your special Helicopter Number and the news-item "Reminiscences of the 504K," I think it might be said that there is some slight connection between both subjects.

In the winter of 1925 I saw at Farnborough a 504K converted into a helicopter. This aircraft had the wings removed and in their place was a single spar with paddle-like flaps fitted at each end. The tailplane was also modified with extending elevators; only the B.R.2 engine, the rudder, and the standard undercarriage skid were retained. The rotor was a four-bladed affair fitted midway above the two seats. If I remember rightly, it was started up by six or more men pulling on rope. I am rather vague as to who was the pilot, but I think it was Capt. Barnard.

After the helicopter landed, two strange planes loomed out of the late afternoon mist; one crash-landed in a nearby field, the other landed alongside the 504K. The crews, who were unhurt, had got lost. They were Japanese round-the-world airmen. Their aircraft were French Breguet biplanes, which, I noticed, had solid rubber tyres.

Farnborough, Hants. T. DELANEY,
Leading Fireman, Air Crash Crew.

[The subject of our correspondent's recollection was, clearly, the Cierva Autogiro, which was having its first demonstration in this country. The basis of this aircraft was, as he says, an Avro 504K fuselage, but the pilot was Capt. Frank Courtney. The Japanese Breguet pilots, on a flight from Tokyo to Croydon, had been diverted to Farnborough by bad weather.—Ed.]



*The markings on this Camel, referred to by Mr. E. G. Ramsey, are suggestive of more modern "aerobatic" decoration.*

### Camel Markings

IN support of Mr. Ronald Sykes' letter (March 19th) on Camel markings, I enclose an album, somewhat the worse for wear, in which are some photographs showing Camels bearing pilots' individual markings. I understand from the person who passed it on to me that these aircraft were of 1918 vintage, and that the pictures were all taken at Freiston.

By the way, I think *Flight* at 1s 6d is still very good value.

Stoneygate, Leicester. E. G. RAMSEY.

[A photograph from the album is reproduced above.—Ed.]

### No. 26 Squadron's Badge

IN the "Service Aviation" pages of *Flight* for February 19th you give a thumbnail sketch of the history of No. 26 Squadron and of its badge. [This information was from Air Ministry sources—Ed.] May I be allowed to give, as far as I remember, the more correct version of how the present squadron crest came into being?

When I took over command of No. 26 (A.C.) Squadron in 1934, the badge was the head of a Grant's gazelle, a creature whose habitat is in Central Africa—not South Africa, be it noted. Subsequently, on taking the squadron to Catfoss in 1934 for the annual armament exercise, I met a wing commander of the armament staff who was a South African and who had actually served in No. 26 Sqn. in South Africa during World War I. This officer (whose name, unfortunately, I cannot remember) told me that when he was in the squadron the badge, most properly, was the springbok.

Now, some time between 1918 and 1934 the springbok must have given way to the Grant's gazelle: when, how or why, I know not. However, further researches having confirmed that the crest in World War I was the springbok, the squadron decided to revert to the old original crest and the Goldsmiths and Silversmiths Co. drew a very pleasing and impressive design incorporating the springbok's head. This crest was subsequently ruled out of order by the College of Arms and the present badge substituted.

Incidentally, I tried to get permission for the squadron to be called No. 26 (S.A.) instead of (A.C.), but A. Cdre. Brock, then commanding No. 22 Group at Farnborough, suggested that the initials S.A. might be misconstrued by the more ribald members of the Service, so no more was heard of that link with South Africa—this, I still maintain, was a pity.

Callington, Cornwall. C. H. STILLWELL
(W/Cdr., R.A.F. ret.).

### No. 47 Squadron's War

I AM prompted to write this letter by the paragraph in the February 19th issue which referred to the presentation of a piece of silverware to No. 47 Squadron at Khartoum. My ire was aroused by the statement [Air Ministry sources—Ed.] that No. 47 was sent to Far East as a "transport support" squadron. As a member of the squadron at the time I well remember the reason for the move and the speed with which it was accomplished. The appearance of a Japanese naval force "near" Ceylon at the end of 1943 or early 1944 had made the Powers that Be aware of the lack of suitable shipping strike aircraft in Southern India and Ceylon, so 47 was whipped away from its snug hiding place at Gambut, Cyrenaica, and deposited on an airstrip outside Madras in April 1944. There the squadron, with its Beaufighter T.F. 10s, stayed until October, when it was re-equipped and converted to Mosquito fighter-bombers, equipped with rockets.

For No. 47, history now repeated itself. In 1941, the squadron was to be re-equipped with Beauforts to replace the Wellesleys used in Eritrea, and came up to Egypt only to find that No. 39 Sqn. had been given all the new aircraft to replace the Marylands that had been transferred to No. 203 Sqn. to make up for that unit's Blenheim losses. Consequently, 47 would have been doomed to a stay in 107 M.U. without aircraft but for the rejuvenation of

## CORRESPONDENCE . . .

some old Wellesleys; with these, the squadron was able to keep one flight active on anti-sub patrols until March 1943, by which time a full complement of Beauforts allowed the squadron to be reconstituted.

So, in 1944, the Mosquitos of 47 were put into a pool to re-equip Nos. 45 and 82 Sqns. All three units had been due for Mossies, but a large number of them were found to be defective, and it was decided to go ahead with 45 and 82, which had had Vengeance dive-bombers, and to let 47 revert to Beaus again.

The old T.F. 10 Beaus came back, had their A.S.V. removed and rocket racks installed, and were then used for night trips in support of the Irrawaddy bridgeheads, shooting up Jap artillery positions, transport (was this the transport support?) and roads, dropping leaflets and fire-crackers. The poor T.F. 10 did not take kindly to being asked to climb over the Chin Hills, and efforts were made to lighten the aircraft by removing the D/F. loops, remote controls, A.S.V. racks, etc. Eventually "A" Flight was re-equipped with Mossies, which were used for daylight rocket attacks on oil-well installations, etc. For a time "B" Flight retained its Beaus, but at the end of the war in August the squadron was completely Mossie-equipped. Not until after the end of the war was the unit re-formed as a transport squadron.

Your series of articles on famous aircraft is grand and I only wish it were possible for them to appear more frequently. However, their accuracy is such that more rapid preparation must be out of the question.

Tangier, Morocco. R. R. OLLETT.

### Cdmt. Bouderie Returns to France

READERS will recall the letter written jointly by G/C. J. Jeffs and Capt. A. G. Lamplugh suggesting a small presentation to me on the occasion of my retirement after 34½ years as representative of Cie. Messageries Aeriennes, Air Union and Air France in this country. Unfortunately, immediately after that letter appeared I became very ill and this delayed, until a few days ago, the informal presentation to me of the most beautiful silver salver with an inscription, the combined effect of which touches me profoundly.

Having made a good recovery I plan to return to France for a time in the early part of April and before leaving I would like to take this opportunity of thanking my very dear old friends for their kind thought, which will always remind me of the happiest years of my life. I shall be returning periodically, and on these occasions I hope to meet many of my old friends.

Sunbury-on-Thames. EMILE BOUDERIE.

### For the Record

IN your issue of March 12th it is stated that the Sikorsky XHR2S is the first helicopter in the world to have a retractable undercarriage. This is not so; the Landgraf helicopter of about 1948-1949 was fitted with a retractable undercarriage and, incidentally, was powered by a Pobjoy engine driving twin rotors carried on outriggers. I also have a suspicion that one or two American "one-off" helicopters have had retractable undercarriages, but am unable to verify this, since my information files are not available.

On a rather different subject, the Lancaster, despite assertions to the contrary that have appeared in your columns, is still in service in the R.A.F. Lancasters are used for training at Coastal Command's School of Maritime Reconnaissance, where I have been a staff captain for the last two-and-a-half years, and I can assure you that the Lancaster is very far from being dead, never mind lying down! In fact, those aircraft are giving a very good utilization rate, despite the inevitable shortage of certain spares (they are now being fitted with Westland Welkin exhaust stubs); there are sufficient Lancasters scattered round the countryside to keep them going for some time, on a cannibalization basis if necessary.

Having been flying Lancasters for the past five-and-a-half years, I feel rather strongly about this premature dismissal of a very fine aircraft, the more so as it is now the sole survivor, in any rôle, of the wartime bombers, and as such deserves honourable mention in your otherwise excellent magazine.

Of course, the Lancaster is still in service with the French Naval Air Arm, and in several versions with the R.C.A.F. Incidentally, there was at Blackbushe in the middle of January a Lancaster Mk 7 in freshly-applied Bomber Command black-and-grey, though what its antecedents may have been is more than I can say.

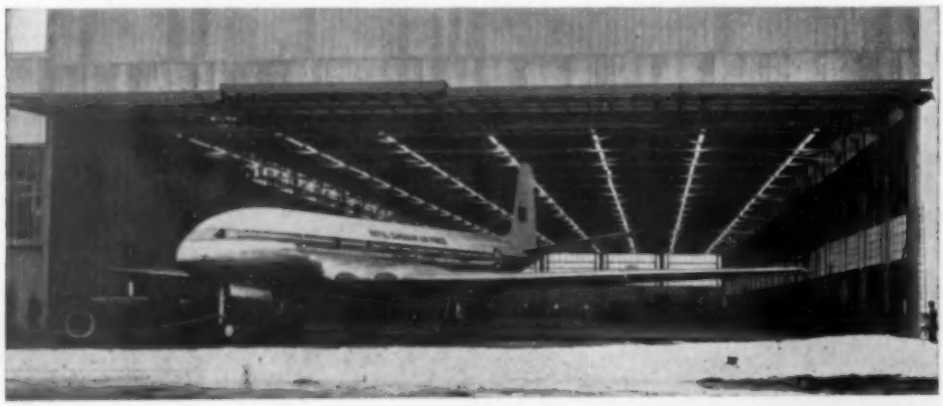
The confusion, of course, originated in the fact that the Air Ministry statement referred to Lancasters *in Bomber Command*. After all, the S. of M.R. did send four Lancasters to Odiham for the Royal Review, and they were visible on numerous photographs of the static display, despite the insistence by a certain group captain that the Lancasters flown by him during the war looked nothing like those on display—this to a high-ranking Naval officer in the hearing of the captain of one of the Lancasters, who had just been asked by the group captain what the aircraft was!

R.A.F., Dishforth. A. W. HAY, F/L.

### FORTHCOMING EVENTS

April 2. Scientific Instrument Manufacturers Association: Annual dinner and dance.
April 2-5. Institution of Production Engineers: Conference on Production Information, College of Aeronautics, Cranfield (jointly with A.S.L.I.B. Aeronautical and Engineering Groups).
April 3. Radar Association: Annual dinner and dance.
April 3. British Interplanetary Society: Film show.
April 6. R.Ae.S. Section Lecture: "A Review from the Design Aspect of Materials used in Rocket Motors," by G. O. Jones.
April 7. Radar Association: "Radar and the Weather," by P. A. L. Harris.
April 6-8. Radio and Electronic Components Exhibition: Grosvenor House, London.
April 8-13. Physical Society: Exhibition of scientific instruments and apparatus, Imperial College of Science and Technology, London.
April 8. R.Ae.S. Main Lecture: "Practical Experience of Airline Engineering," by R. C. Morgan, O.B.E., F.R.Ae.S. (at Chester).
April 8. Society of Instrument Technology (Control Section): Discussion on "Rationalization of Units for Electrically Operated Servos."
April 9. Helicopter Association: "Navigation of Helicopters," by D. M. Davies.
April 10-13. Air display and show, Rhine-Main Airport, Frankfurt.
April 10. British Interplanetary Society (Midlands Branch): Film show, "Destination Moon."
April 10. British Interplanetary Society (Provisional Yorkshire Branch): "Life on Other Planets," by G. Hollis.
April 13. R.Ae.S. Section Lecture: "Aspects of Modern Aircraft Materials," by Dr. H. Sutton, C.B.E., F.R.Ae.S.
April 14. Royal United Service Institution: "Air Power and the Future of War," by Marshal of the R.A.F. Sir John Slessor, G.C.B., D.S.O., M.C.
April 22. R.Ae.S. Main Lecture: "Diesel Compound Engines," by E. E. Chatterton, B.Sc., A.M.I.Mech.E., F.R.Ae.S.
April 22. Guild of Air Pilots and Air Navigators: Annual general meeting.

**R.Ae.S. Branch Fixtures (to April 23):** April 2, *Leicester*, "Supersonic Bangs," by G. M. Lilley.
April 5, *Derby*, "Aspects of Airline Flying with Jet Aircraft," by Capt. W. G. Johnson. April 6, *Belfast*, "Engineering Problems of Airline Operation," by B. S. Shenstone; *Glasgow*, "The Piston Engine and the Development Engineer," by J. M. Marshall. April 7, *Bristol*, annual general meeting, and film show; *Weybridge*, brains trust; *Luton*, "Guided Weapons," by W. H. Stephens. April 8, *Chester*, Main Lecture (see above).
April 13, *Belfast*, annual general meeting; April 14, *Glasgow*, annual general meeting; *Hatfield*, discussion evening; *Preston*, annual general meeting and film show. April 15, *Gloucester and Cheltenham*, annual general meeting.
April 23, *Hatfield*, annual dinner.



## SHORT HOP FOR COMET

*A Comet of the Royal Canadian Air Force is moved from the de Havilland plant at Toronto to the company's new overhaul bay a mile away. The aircraft is a Series 1A, with Ghost 50 Mk 2 turbojets and a fuel capacity of 7,000 Imperial gallons. The R.C.A.F. uses its two Comets—delivered in the summer of last year—for transport duties and for fighter and radar affiliation exercises.*

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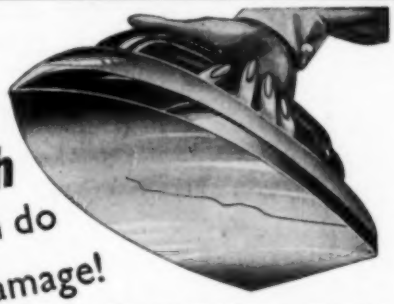

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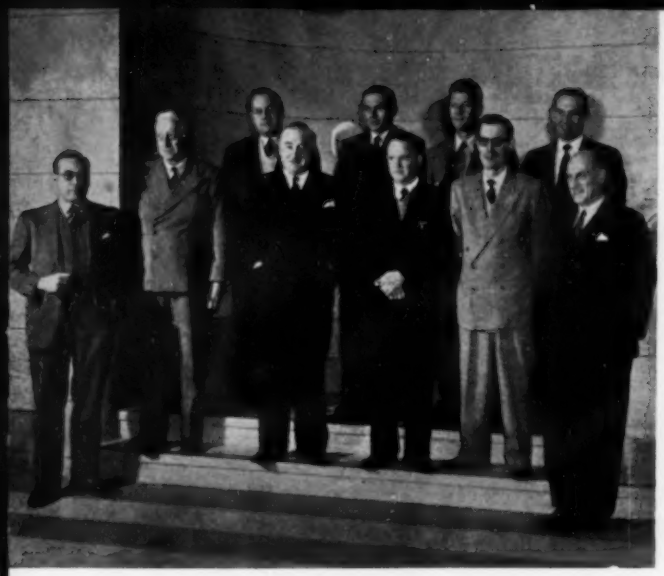


*AT THE MARCONI CONFERENCE: Among those who met at Chelmsford to discuss aeronautical radio (see item below) were, left to right: Back row: H. A. Rice, manager, general products divn., C.M.C.; D. Craig, London manager, A.W.(A.); A.J. Campbell, i/c production engineering and development, A.W.(A.); E. W. Beasley, aviation department, C. M. C. Second row: G. M. Wright, engineer-in-chief, M.W.T.; F. N. Sutherland, general manager, M.W.T.; W. R. Thomas, general management, A.W.(A.); C. E. Tremblay, aviation department manager, C.M.C. Extreme left: Dr. B. J. O'Kane, M.W.T. aeronautical division chief engineer. Extreme right: L. A. Sweny, M.W.T. aeronautical division manager.*

# THE INDUSTRY

## Redhill Activities

SPEAKING at the recent annual general meeting of Tiltman Langley Laboratories, Ltd., of Redhill, Surrey, the chairman, Mr. A. Hessell Tiltman, reported a tenfold increase of work in hand. He said that the company had received a £200,000 M.o.S. contract for the large-scale production of secret equipment of "the highest national importance" designed and developed by the laboratories. This contract would allow the company to increase its production facilities.

Tiltman Langley, it is learned, are at present using a lithographic process to prepare detail plates for lofting for leading aircraft firms. Mr. Tiltman was responsible for the preparation of the first complete survey of full-scale layout in this country, which he carried out in 1943 for the S.B.A.C. after visiting America with the Fedden Mission. A sub-committee of the S.B.A.C., of which Mr. Marcus Langley (T. L. managing director) was a member, considered his report and proposed a standardized layout system for the whole British aircraft industry.

In addition to Tiltman Langley's expansion in London, the test houses and workshops at Redhill are also being enlarged. Last year, the company was engaged on a number of Government and commercial contracts, and these included the development of a pesticidal smoke generator (described recently in *Flight*). The company also developed a rapid linear actuator test rig, to check the functioning of electrically operated linear actuators from 50 to 1,200 lb line load with respect to current consumed and operation time when loaded to maker's specifications.

In the field of research-equipment development, the company perfected a vibration test-table for the R.A.E. Using a new principle, this unit is capable of giving 20 to 250 c.p.s. frequency, with accelerations from 0 to 10 g, both infinitely variable independently of each other, and operation can be effected without stopping the machine.

The programme of investigation of the application of the Gerritsen infinitely variable system of transmission and the Hayes gear is continuing at Redhill. Work on the Tiltman Langley flow-valve is also progressing. The Redhill workshops, too, are undertaking a steady volume of modification for various B.O.A.C. and B.E.A. aircraft.

## Instrument-manufacture Appointment

IT is announced that Mr. A. G. Peacock, B.Sc., A.R.I.C., A.Inst.P., has resigned his position as secretary of the Scientific Instrument Manufacturers' Association and has joined the Board of Mervyn Instruments, St. John's, Woking, Surrey.

Mr. Peacock is perhaps best known as the hon. exhibition secretary of the Physical Society, and as an advocate of increased publicity for British instruments he is a well-known figure at exhibitions both in this country and abroad. He has been closely concerned with the activities of the Scientific Instrument Manufacturers' Association, and has for a number of years assisted in the organization of the Electronics Symposium held by the Electrical and Electronics Group of S.I.M.A.

Mervyn Instruments, established some 21 years ago, have since 1939 become increasingly active in the commercial instrument field. They also undertake much experimental work on behalf of Government and Service departments.

## Aeronautical Radio Discussed

VALUABLE discussions on the design and use of aeronautical and navigational radio equipment on a world-wide basis took place at Chelmsford recently, when executives of Marconi's Wireless Telegraph Co., Ltd., and of their overseas associates, Amalgamated Wireless (Australasia), Ltd., and the Canadian Marconi Co., met for a 19-day conference. The chairman was Mr. F. N. Sutherland, manager of the aeronautical division.

In his speech of welcome to the delegates, Mr. F. N. Sutherland (Marconi general manager) spoke of the increasing complexity of aeronautical radio requirements, and of the importance of radiocommunications in aiding the safety and reliability of air transport. The problems thus posed, he said, would fully occupy the attention of the visitors.

The conference gave the subject of servicing and maintenance facilities particularly careful study; the contribution made by the A.W.(A.) delegation to this item of the agenda was of especial value in view of their long and extensive experience in this specialist field. Among other things, it was agreed that one essential was a greater degree of standardization in such matters as design practice, components and documentation. In this light the major products of the companies were discussed in detail.

## Hobson Progress

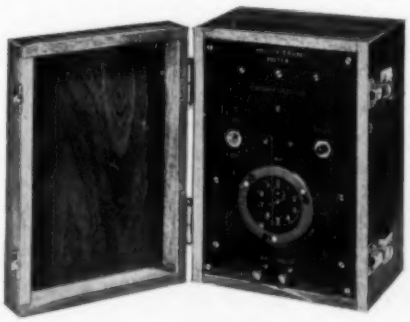
IN his speech at the recent annual general meeting of H. M. Hobson, Ltd., Mr. S. W. Hughes (chairman) said that the company looked forward with confidence to the future: although the demand for their products for piston engines was affected by the adoption of the jet engine, they still retained a goodly volume of business in both new carburettors and spares for aircraft engines. Their new products in the aircraft world, and in the field of guided weapons, had created very great interest, and substantial orders had already been placed.

The balance sheet of H. M. Hobson, Ltd., and their associated company, Integral, Ltd., was described by Mr. Hughes as being one "of exceptional financial strength." As already recorded in *Flight*, group profit for the year was £380,054, of which taxation absorbs £250,200.

## For Time-recording

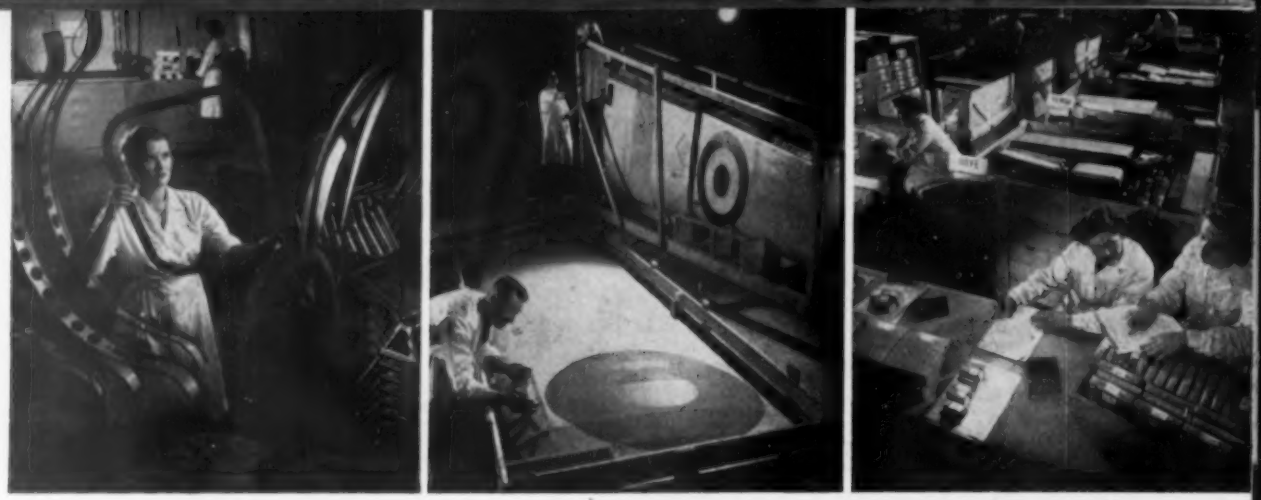
IN certain research and development processes, and in other industrial applications—e.g., time-and-motion study—where accurate measurement of time is essential, there is often a need for a high-precision time-interval meter.

Such an instrument is marketed by Camerer Cuss and Co., the well known clock and watch specialists of New Oxford Street, London, W.1. It has been developed in conjunction with Allied Electronics, Ltd., of 28 Upper Richmond Road, London, S.W.15. As the power is provided by two standard deaf-aid dry batteries, the instrument is independent of mains and free from any errors introduced by mains frequency.



*The utility of a stop-watch, and the accuracy of its recording, are greatly increased by using it in conjunction with the electrical system described here.*

Starting and stopping are controlled by the closing of an electric circuit, so that times can be recorded automatically by means of a standard N.P.L.-quality stop-watch incorporated in the instrument, such as the Camerer Cuss Model 308. Control may be effected over very long circuits, and resetting may also be remotely controlled. Photo-cell units can be introduced.



*GIVING THEM A SEND-OFF: These photographs were taken in the de Havilland spares department at Chester; comments on each scene will be found in "A Works Within a Works," immediately below.*

## THE INDUSTRY . . .

### A Works Within a Works

PERHAPS because it is less spectacular than, say, test-flying, one aspect of an aircraft constructor's daily activities that normally receives little publicity is that of spare-parts supply. Yet, in a large organization whose aircraft are used in all parts of the world, the spares department is a busy, complex unit ranking in importance with any in the works.

The photographs on this page were taken in the de Havilland Aircraft Company's spares department, which, located at the Chester Factory, is complemented by corresponding units maintained by the D.H. engine and propeller companies.

The first of the four pictures, reading from left to right, shows the preparation of airframe pressings for transport. The parts have been coated with molten protective wax, and the girl is hanging them up (over sawdust-bins to catch the drippings) for the wax to harden.

Packaging of major components, like the Chipmunk and Tiger Moth wings in the second picture, must be based on scientific crate-design and good workmanship if the parts are to emerge unharmed after the hazards of journeys by rail, road and sea. A thousand pounds' worth of timber is used for cases and crates every week.

Next is seen the checking of cartons containing small parts and, in the background, their crating. Here the parts are correlated with their release-notes, some 2,000 of which are issued at Chester each week.

In the final view, a D.H. lorry collects a portion of the day's freight. Operators in 40 different countries are at present being supplied with spares from Chester.

### Compact Control

TO meet a demand for a miniature stud-type attenuator or fader, Painton and Co., Ltd., of Kingsthorpe, Northampton, have introduced the new "midget" instrument illustrated here.

Primarily designed for audio applications (although in special circumstances it may be satisfactory on carrier frequencies up to 4 mc/s), the unit is of only 1½in diameter and 1⅛in long. Painton 0.25W high-stability carbon resistors are employed, and the unit can accommodate either a ten-step twin-arm network (e.g., bridge T) or a 20-step single-arm network (unbalanced potentiometer).

The instrument is stated to be ideal for use as a microphone-balancing potentiometer or in similar applications, and because of its compact design, it is well suited for use in portable equipment and similar situations where mounting space is limited.

*Apart from its primary uses, the Painton miniature attenuator should have useful applications in radio research, test and maintenance work.*

## IN BRIEF

We learn with regret of the death of Mr. A. A. Pearson, chairman of British Belting and Asbestos, Ltd., Cleckheaton. He began his career with the company's predecessors in 1889.

* * *

Mr. B. H. Dulanty, chairman of Silentbloc, Ltd., and Mr. I. M. Gillett, managing director, have been appointed directors of the Andre Rubber Co., Ltd. Mr. H. Clements has been appointed joint managing director of the Andre Rubber Co., Ltd., and a director of Silentbloc, Ltd.

* * *

Skefko Ball Bearing Co., Ltd., announce that Mr. E. Y. Caswell has relinquished his duties as manager, Bristol district, to join the head office executive staff as sales manager. He began his career at Skefko's Birmingham office in 1931, becoming assistant district manager in 1937; he was appointed district manager at Bristol in 1946.

* * *

In amplification of a recent reference to the cloud-warning radar standardized in the R.C.A.F. Comets, it should be added that this all-British equipment is the Ekco airborne search radar developed by E. K. Cole, Ltd., in conjunction with the M.o.S. The Comet installation was illustrated in our British Aircraft Industry Number at the time of the last Farnborough Show.

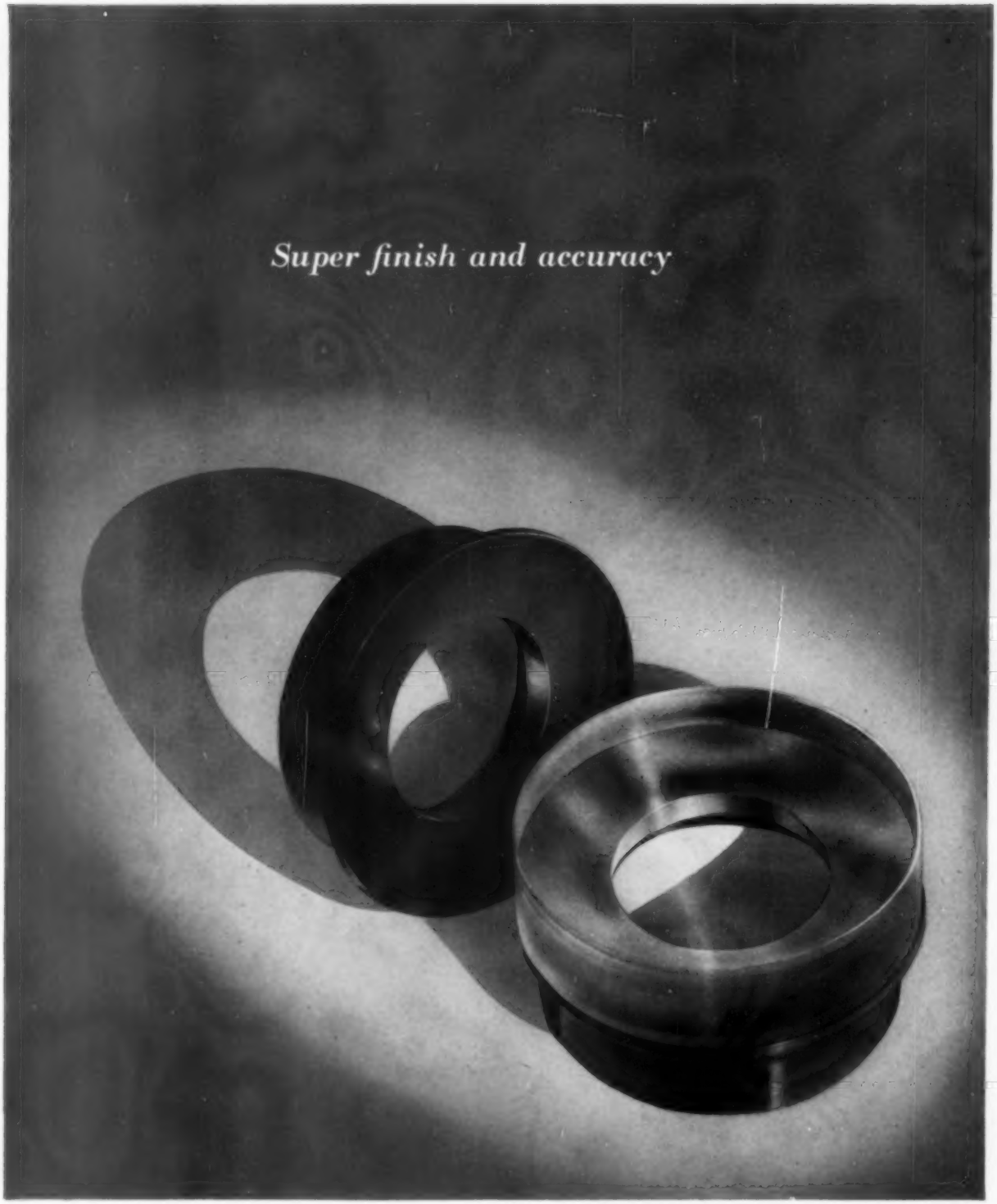
* * *

The Hymatic Engineering Co., Ltd., of Redditch, Worcs, have received—"in recognition of an outstanding engineering achievement in the design of a lightweight air compressor"—a certificate awarded by the American publication *Design News*, a journal specializing in the field of design-engineering and product-development. The compressor in question, the HC51, was designed to operate up to 3,000 lb/sq in for aircraft applications and has received M.o.S. type approval.

* * *

Automotive Products Co., Ltd., and its associates, the Lockheed Hydraulic Brake Co., Ltd., and Borg and Beck Co., Ltd., announce the appointment, as deputy managing directors, of Messrs. A. C. Burdon, N. C. A. Spurgeon and E. W. Swales. In addition, executive directors have been appointed who will head specialized activities within the three companies as follows: Mr. E. Beaumont (production), Mr. S. M. Parker (engineering), Mr. S. Westwood Smye (purchasing). Mr. J. B. Emmott has been appointed an alternative director to any member of the Board.

VICKERS SUPERMARINE SWIFT
VICKERS-ARMSTRONGS LIMITED · SUPERMARINE WORKS




*No. 7. The optical maker's art applied in producing camplates for high-pressure fuel pumps.*

FUEL AND COMBUSTION SYSTEMS FOR GAS TURBINE ENGINES

LUCAS

JOSEPH LUCAS (Gas Turbine Equipment) LTD. BIRMINGHAM AND BURNLEY

# COMET PRODUCTION AT CHESTER

IN October 1952 it was announced that the de Havilland Aircraft Company had decided to build Comet 2s—and later 3s—at their Broughton (Chester) factory, as well as at Hatfield, and that Short Bros. and Harland were to provide a third production line at Belfast. This decision was taken on the basis of potential rather than actual orders for Comets and represented a bold approach to the delivery-date problem.

These photographs, taken at Broughton last week, indicate the remarkable progress made there in the past 18 months. At the head of the line, and due for flight-test in July or August, is the first of three Comet 2s for U.A.T. It has been allocated the works number 6045, meaning that this is the 45th airframe in the basic D.H. 106 series. Farther back on the assembly tracks, the fuselage shells of Nos. 46-49 inclusive are taking shape as the various trolley-mounted sections are aligned and "sewn up." The first few Chester-built Comet 2s embody a number of Hatfield-supplied components, but the factory is now almost independently capable of building complete Comets, having its own Reduxing shop, pressure-test section and full jigging for the major assemblies. The D.H. spares organization—as described on the previous page—is also centred at Broughton.

*The heading picture, taken last week in the de Havilland factory at Broughton, Chester, focuses attention on the new production line for Comet 2s. On the right, Comet construction is seen in relation to the entire productive effort—civil and military—of this huge plant, which also builds Venoms, Vampire Trainers, Chipmunks, Doves and Herons. The assembly line in the foreground has already turned out more than 40 Herons, and 20 more are due for completion in the next few months.*

"FLIGHT" photographs

*BACK AT WORK: B.O.A.C.'s Comet services on the London-Johannesburg route were resumed on March 23rd. This was the scene at London Airport when G-ALYX set off to cover the 6,280 miles in 22 hr 19 min (slightly ahead of schedule). The London-Colombo Comet service will be restored on Wednesday, April 7th.*

# CIVIL AVIATION

## VISCOUNTS FOR EGYPT

THE privately owned Egyptian airline Misrair S.A.E., at present equipped with Vikings and Languedocs, has placed an order for three Vickers-Armstrongs Viscounts. The first of the new aircraft will be delivered in July next year and the other two will follow almost immediately afterwards. In accordance with the makers' policy of allocating an individual type number to each customer's aircraft, the Misrair machines will be known as Viscount 739s.

Altogether 91 Viscounts have now been sold to eleven different operators. There follows a break-down of orders placed to date:

| Type No. | Operator | No. ordered |
|---|---|---|
| 701 and 801 | British European Airways | 38 |
| 708 | Air France | 12 |
| 707 | Aer Lingus | 4 |
| 720 | Trans-Australia Airlines | 6 |
| 724 | Trans-Canada Air Lines | 15 |
| 702 | British West Indian Airways | 3 |
| 732 | Hunting-Clan Air Transport | 3 |
| 735 | Iraqi Airways | 3 |
| 723 and 730 | Indian Air Force | 2 |
| 736 | Fred Olsen Airtransport | 2 |
| 739 | Misrair S.A.E. | 3 |
| | Total | 91 |

At the time of writing B.E.A. have received 20 of their 26 Type 701s; their remaining 12 Viscounts will be Type 801s with lengthened fuselage. Separate type numbers have been allocated to the two Indian Air Force machines since one (Type 730) will be a V.I.P. transport for the Prime Minister and senior Government officials and the other will be a 48-seater.

## WEST AFRICAN SAFARI

PROVING flights of a new Colonial Coach service jointly operated by Airwork, Ltd., and Hunting-Clan Air Transport, Ltd., are to be made this month. The service is between London and Bathurst, Freetown and Accra, and the inaugural passenger flight will leave on May 10th. There will be one trip weekly in each direction, flown alternately by Hunting-Clan and Airwork with 27-seat Vikings.

As on the existing "Safari" services (to East Africa and to Rhodesia) flown by the two companies, tickets will be interchangeable. Attractively low fares will be charged: the price of a London-Accra return ticket, for example, will be £144, compared with the first-class and tourist return fares of respectively £214 4s and £169 4s.

The route flown will be London (Bovingdon for Hunting-Clan; Blackbushe for Airwork), Bordeaux (later Biarritz), Tangier, Agadir, Villa Cisneros, Dakar, Bathurst, Freetown, Robertsfield (or Abidjan), Takoradi and Accra. Night stops will be made at Tangier and Dakar.

*ARCTIC OTTER: A D.H. Otter floatplane has been ordered for scheduled operation along the Norwegian coast by the engagingly titled Widerøe's Flyveselskap Og Polarfly A/S, of Oslo. Discussing the deal here are (left to right) Mr. Willy Fredriksen and Mr. K. Fris Baastad, respectively works manager and chief pilot of the Norwegian company, and Mr. Len Appleyard of de Havilland Canada. The picture, incidentally, stresses the often under-estimated size of the 14-seat, single-engined Otter.*

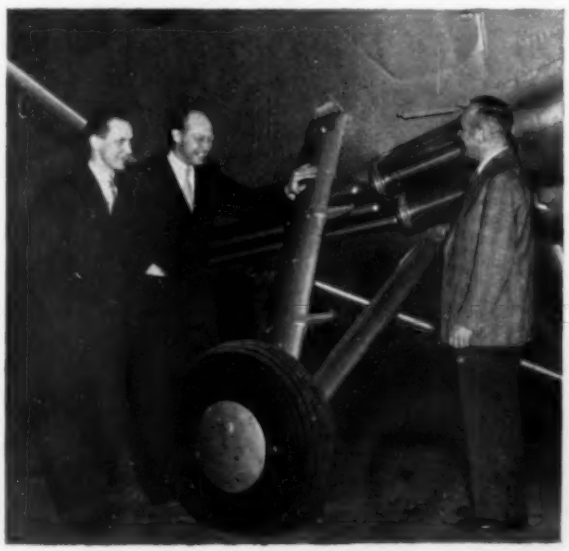
## BRITAVIA AND THE HERMES

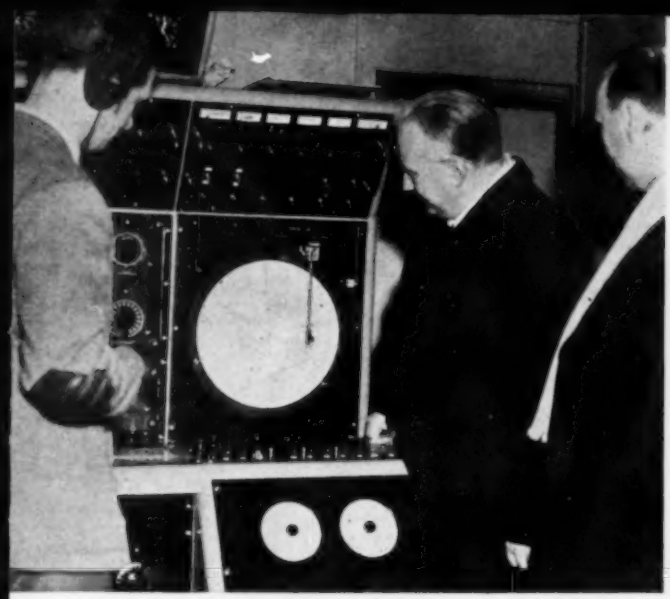
THE dispute involving B.O.A.C. engineering staff who had threatened not to work on Hermes aircraft sold to independent airlines (*Flight*, March 26th) showed signs of subsiding as we go to press. Union leaders said that men would handle the aircraft on condition (a) that purchasers would operate at wages and conditions not less favourable than those applicable in the Corporation; and (b) overhaul of engines would continue at Treforest. At a meeting held on March 25th, the Corporation agreed that the union leaders were entitled to make an approach on the question of the Hermes, and undertook to consider their views.

Newspaper reports said on March 26th that the dispute had resulted in the withdrawal of an offer by Britavia, Ltd., to buy four of the Hermes. These reports drew the following statement from Mr. E. C. Mekie, chairman of Britavia, Ltd., which is the parent company of Silver City Airways and Aquila Airways:

"Owing to erroneous statements which have been made, Britavia, Ltd., desire to make their position clear. Britavia have not withdrawn their offer for four Hermes and the industrial discussions at London Airport have had no effect on Britavia's intentions. Incidentally, Britavia maintain conditions of pay, etc., agreed with the National Joint Council for Civil Aviation and always intended to use the B.O.A.C. facilities [for engine overhaul] at Treforest.

"Both Britavia and B.O.A.C. have similar desires to maintain friendly relations between the Corporations and the independent airlines and B.O.A.C. have re-affirmed their willingness to fulfil the contract on the basis originally agreed."





*LOOKING IN at Meadowbank, during his recent visit to this country, Dr. Hans Seebohm (centre), Federal German Transport Minister, inspects the course "flown" by a B.O.A.C. crew in the Comet simulator.*

## LUFTHANSA AND BRITAIN

SPEAKING at a Hamburg press conference after a week's visit to Britain, Dr. Hans Seebohm, Federal Transport Minister, said that he expects that a decision as to the way in which the new Lufthansa will operate would be made within the next three months, if the German-Allied treaty had not come into force by then.

Dr. Seebohm put forward three possible solutions. The Federal Republic could ask the High Commissioners for a special concession allowing the right to operate an airline. Such a decision would have to be taken unanimously by the three Allies, and the position of the French was not yet clear. The other two possibilities were either to charter the Convair aircraft bought by Luftag to an American company or to B.E.A. The Minister added that he had been greatly impressed by the efficiency of the British aviation industry. It was possible that the future Lufthansa might show increasing interest in the surprisingly economical types of passenger aircraft developed in Britain.

## S.A.S. PROFIT PLOUGHED BACK

DURING the financial year ended September 30th, 1953, Scandinavian Airline System made a gross profit of £1.8m compared with £1.4m in 1951-52. After making allowance for depreciation of aircraft the company was left with a net profit of just over £150,000 and this amount also is being set aside towards depreciation. During the 12-month period concerned, the number of passengers carried by S.A.S. increased by 100,000 to a total of 670,000.

## AEROFLOT AND THE WEST

ALTHOUGH Marshal Zhavoronkov, the chief executive of Aeroflot, refused to speak with Western journalists during his recent visits to Scandinavia and France, one of the Air France executives who acted as his hosts made a brief but enlightening comment on the visit. He said: "We understand the Russians wish to familiarize themselves with Western commercial airline systems before considering the possibility of co-operation." He added, however, that it was premature to talk of airline negotiations with the Russians; such talks would have to be held at diplomatic level. It is thought that the possibility has already been raised during talks between M. Max Hymans, director of Air France, and M. Joxe, the French ambassador to Moscow.

## HELICOPTERS AND SABENA

IN five years' time helicopters will be responsible for nearly half the ton-miles flown on the European routes of Sabena Belgian Airlines. This forecast was made in New York last week by Mr. Anselme Vernieuwe, the company's operations director. Sabena's S-55s at present operate from Brussels to Lille, Antwerp, Rotterdam, Liége, Maastricht, Cologne and Bonn, and plans have been announced for extending the network to Arlon, Luxemburg and Saarbrucken in the near future.

M. Vernieuwe announced that the S-55s would also operate to Essen, Duisburg and Krefeld within a few months.

## BY FLYING BOAT TO CAPRI

FRENCH and Italian Government approval has been given to Aquila Airways' proposed flying-boat service from Southampton to Marseilles and Capri. To be inaugurated in June with 42-seat Solents, the service will initially operate on a twice monthly basis, increasing to a weekly frequency shortly afterwards. First-class fares for the flight to Capri will be £66 12s return and £37 single. This will be the first air service to Capri, and all hotels there are offering reduced rates to air travellers.

## TO OVERHAUL M.T.C.A. FLEET

EFFECTIVE from April 1st, the three-year M.o.S. contract for maintenance of the M.T.C.A. Flying Unit aircraft has been awarded to Aviation Traders (Engineering), Ltd. The unit's fleet is based at Stansted, Essex, and consists of five Doves, three Princes, five Consuls, one Gemini and one Chipmunk. Aviation Traders already possess comprehensive hangar and workshop facilities at Stansted, where they are responsible for maintenance of the fleet—which includes 11 Tudors, 11 Yorks and two Bristol 170s—operated by their associated company Air Charter, Ltd.

## SUPER CONSTELLATION DELIVERIES

THE first of eight Lockheed L.1049Cs ordered by Qantas Empire Airways was formally accepted by representatives of the Australian airline at San Francisco last Monday. Qantas expect to have four Super Constellations by July. The type will shortly enter service on the former B.C.P.A. transpacific route linking Sydney with Vancouver.

Another Commonwealth airline—Air-India International—will also introduce the Super Constellation in the near future. Last week four of the company's flight executives flew to America from London for three-week type conversion courses, after which they will deliver the first aircraft to Bombay for introduction, this summer, on Air-India's London, Tokyo and Singapore services.

*BULLS FROM BRITAIN: Recent cattle flights of note were made by an Eagle Aviation Dakota (right) and a Silver City Freighter. Eagle carried three Shorthorn bulls from Blackbushe to Dinard; Silver City, using a new 200 lb loading ramp designed for stowage aboard the aircraft, took a bull, cow and two heifers from Lympne to Le Touquet.*

*SIR MILES THOMAS took this picture of construction work at the new airport of Paya Lebar during his recent visit to Singapore. The engineers, he tells us, have encountered one unusual problem in the form of a holy tree which has to be transplanted before the final approach can be cleared.*

## CIVIL AVIATION . . .

### TOO OLD AT THIRTY-TWO?

EXPLAINING that one of the many qualifications for an air stewardess was an attractive appearance, which "ordinarily is found to a higher degree in young women," American Airlines recently announced their decision to ground stewardesses of 32 and over. As might be expected, the announcement inspired a great deal of discussion in newspapers and magazines, and in almost every case the verdict went against American Airlines.

This typical comment comes from a Canadian newspaper, *The Hamilton Spectator*: "To our own private list of airlines we prefer not to patronize we are considering adding the one in the United States which announced the other day that it will not employ stewardesses over 32 years of age. . . Come to think of it, the best airline stewardess we have ever encountered anywhere—an English girl—was distinctly lumpy both of figure and of face." And, as a final broadside: "Perhaps this airline believes that in this topsy-turvy world the bulk of its passengers from now on will be juveniles. In that case we presume it is also fitting its aircraft with racks for comic books."

The ladies had the last word. On March 24th American Airlines announced that all stewardesses in the airline's employ on December 1st last year would be permitted to continue flying after the age of 32. The "too-old-at-32" rule would apply, however, to stewardesses recruited after that date.

Since 1949, incidentally, the number of stewardesses employed by the company has increased from 450 to 1,150—a world record total. The average length of service for an A.A. stewardess is just over two years and the present monthly turnover is about 35. Marriage is the usual reason for retirement.

The British Airways Corporations follow a more realistic approach to the problem. Both B.O.A.C. and B.E.A. inform us that the question of fixing an upper age limit for stewardesses has never arisen. A B.O.A.C. spokesman said that the Corporation has a number of stewardesses over 32 but that the majority left of their own accord before they could be regarded as too old for the work; B.E.A. added that none of their stewardesses had ever been retired on grounds of age, observing tactfully that "efficiency is the test." Age brackets for trainee Corporation stewardesses are 21-27 (B.E.A.) and 21-28 (B.O.A.C.).

*AT PAYA LEBAR: Sir Miles discusses this important project with Mr. J. J. Bryan (centre), the engineer-in-charge, and Capt. Roger Mallard of Malayan Airways. About a third of the runway has been paved.*

# BREVITIES

A NEW R/T. channel, working on a frequency of 121.9, is to be introduced at London Airport for controlling all surface traffic, including aircraft taxying to and from the runway in use.

* * *

The overhaul life of Bristol Centaurus 661s fitted in B.E.A.'s Elizabethans was last week extended from 700 hours to 1,000 hours. Civil operation of the engine began in June 1952, with an initial period between overhauls of 300 hours.

* * *

The Swiss Helicopter Company of Berne has bought a Bell Model 47G, to be used initially for the training of pilots on behalf of the Air Ministry and Air Force. Later this year the company proposes to open mail services between Geneva and Lausanne and St. Gall and Zurich.

* * *

It is reported from Calcutta that cloud-warning radar equipment will be installed at Dum Dum Airport during the coming monsoon season. The equipment will be an improved version of the Decca radar installed at Entebbe, Uganda, which can detect a moderately large thunderstorm formation at a range of nearly 80 miles and larger storms at up to 120 miles.

* * *

In an article entitled "Is Your Journey Really Necessary?" published in the March issue of *The Log*, the official journal of B.A.L.P.A., a B.O.A.C. captain urges the abolition of practically all Link training for qualified route pilots. The writer contends that the Link trainer is useful only for teaching procedural flying, with which the qualified route pilot is already familiar. The route pilot's need for practice, he says, can only be met by actual flying or by a flight simulator.

* * *

The average number of daily aircraft movements at Kingsford Smith Airport, Sydney, in 1953 was 132.4, which represents a 2.4 per cent decrease on the 1952 figure. The number of passengers handled there, however, increased by 3.3 per cent to 892,790—a daily average of 2,446. Freight and mail totals for the year were 18,275 tons and 1,446 tons, increases of, respectively, 17.5 per cent and 10.4 per cent.

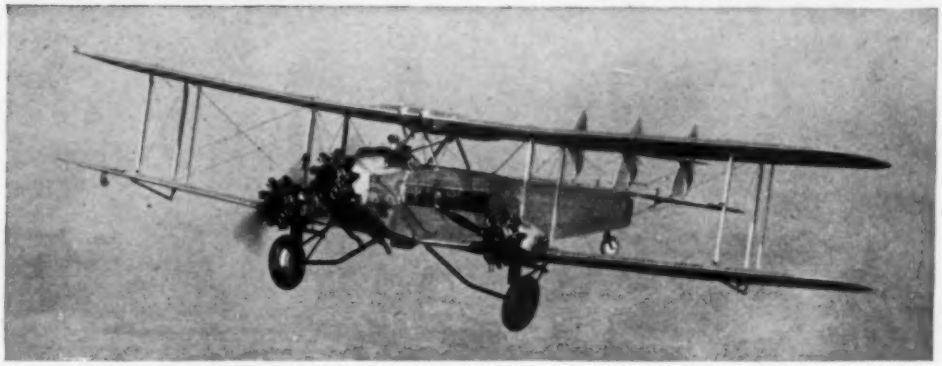
* * *

Central African Airways' latest service, due to be inaugurated yesterday, is a weekly return trip by Viking between Salisbury and Durban. The new service, named the "Coastal Viking", takes four and a half hours for the direct journey. At Johannesburg, which is linked to Salisbury by a twice daily C.A.A. Viking service, the airline employs cars instead of buses to transport passengers between Jan Smuts Airport and the city centre; the new system is reported to be more economical as well as being more popular with passengers.

* * *

Members of the Isle of Man Airports Board are protesting against B.E.A.'s proposal to increase domestic fares by an average of 10 per cent. The Channel Islands authorities have already registered a similar complaint. Discussing the subject in the March *B.E.A. Magazine*, Mr. Peter Masefield observes that U.K. domestic fares are without exception below those prevailing on international routes and, as an example, quotes the London-Jersey average fare of 5.32 pence per passenger-mile compared with a corresponding figure of 6.85 pence on the London-Paris route. To exempt the Channel Islands routes from the increases, he concludes, "would be economically unsound and commercially indefensible."

By
MAXWELL
TAYLOR



*An Imperial Airways D.H. Hercules—the type which operated the 3,000-mile Alexandria to Karachi section of the pioneer route. Note the open window—subject of comment by the author.*

# IMPERIALLY to INDIA

## *A B.O.A.C. Passenger to Karachi Recalls a Journey of Twenty-five Years Ago*

IN its issue of April 4th, 1929, *Flight* said in a leading article: "At long last a start has been made with a real Empire air route. Saturday, March 30th, 1929, deserves to go down in history as a red letter day for British aviation." *Flight's* reason for so describing that date was that it saw the opening of the first direct air service from London to Karachi —then the airport for the whole of India.

The route to India had been surveyed some four years earlier, and the proving flight took place in December 1926, when Imperial Airways carried a party of distinguished passengers from Croydon to Karachi. Among them was Lord Templewood, then Sir Samuel Hoare, who was Secretary of State for Air. But it was more than two years before the regular service was to start, owing to difficulties with the Persian Government about landing rights. Even then the direct air route was direct in name rather than in fact.

I was one of the first passengers to travel from London to India by air when the service began twenty-five years ago. Our route was from Croydon Airport to Le Bourget and on to Basle, by Armstrong Whitworth Argosy (three Armstrong Siddeley Jaguars). It was at Basle that the service failed to live up to its title of "direct," for, owing to some recalcitrance on the part of the Italian Government, passengers had to transfer to the night train for Genoa. The journey by train at least kept us going through the night whereas, had we been travelling by aeroplane, we should have had a night stop *en route*, for there was no nocturnal flying in those days.

At Genoa we transferred to a Short Calcutta flying-boat (three Bristol Jupiters) and were once more airborne. The route of the flying-boat was by way of Rome and Naples, where we spent our second night on land; thence to Corfu and Athens for another night stop; on to Suda Bay in Crete; and then to Tobruk, whose name was to become a household word some twelve years later. The final hop in the Calcutta was from Tobruk to Alexandria, and here we transferred to a de Havilland D.H. 66 Hercules (three Jupiters) which took us to Gaza for yet another night stop.

The Hercules flew at an average speed of about 100 m.p.h. I am no judge of heights, but I remember passing over a P. and O. liner in the Suez Canal and having a clear view of the passengers waving to us from the deck. At Gaza, the airport for Jerusalem, we were surprisingly met by a squad of Grenadier Guardsmen, who had been sent to protect us from stray bullets which the Arabs and the Jews were exchanging.

It was from Gaza onwards that I found the journey most interesting. We flew quite low—and, by modern standards, quite slowly—over apparently endless wastes of desert. The Hercules had sliding windows similar those which used to be fitted to the top decks of London buses, and it was quite possible, at the expense of having one's eyes and ears filled with sand, to put one's head out of the window. It was curious to see the shadow of the aircraft bumping along hour after hour over the sand dunes. Our first stop after Gaza was Rutbah Wells, an amazing oasis of comfort and good food in an otherwise featureless desert. Our next sight of any habitation was Baghdad, where we spent the night in an hotel.

Then on to Basra, Bushire, Lingeh and Jask for our final night stop. Each place seemed from the air to be merely a blob of habitation, either in the middle of the desert or on the shores of the Persian Gulf. Accommodation at some of the smaller places was, to say the least of it, crude; this no doubt accounts for the fact that prospective women passengers were gently discouraged from attempting the journey.

Our final hop, on the last day, was from Jask to Gwardar and thence to Karachi, where we arrived dirty, tired and almost deafened by the noise of the Hercules' three engines, heard only too clearly through the not-too-well fitting windows and the plywood-and-fabric fuselage walls. Total flying time: 53 hours 35 minutes; travelling time, just under eight days.

I have said "we" above a number of times, but in fact throughout the greater part of the journey I was the only passenger and so was able to enjoy the privilege of travelling in the open cockpit with the pilot. He, by the way, wore a white sun-helmet quartered in blue and white squares, presumably so

*This article was written at Karachi, whence the writer had travelled by B.O.A.C. Argonaut; it would have been a Comet but for the temporary suspension of the service.*

## IMPERIALLY TO INDIA . . .

that he might be readily identified by his friends and colleagues flying above him.

Had I not been the only passenger, perhaps the pilot might have removed a little notice which I saw over the entrance to the alcove at the tail end of the aircraft—and that would have been a pity, for it read: "Passengers are requested not to use this lavatory when the plane is flying upside down."

Now, twenty-five years later, I have been able to make the journey again. It should have been by Comet for the sake of the most extreme comparison, but that was not to be. So the journey this time was by B.O.A.C. Argonaut *Atalanta*, the aircraft which took the Queen, then Princess Elizabeth, and the Duke of Edinburgh to Kenya. Elapsed time for the flight was 26 hours, with 60-minute transit stops at Düsseldorf, Rome, Beirut, Baghdad and Bahrain.

Comparisons—all favourable to the modern means of making the journey—crowd in on one another. Uppermost in my mind at the moment of writing (in Karachi, not long after arrival) are memories not directly concerned with flying. First, never in my experience have I eaten so many appetising and ingeniously prepared meals in so short a space of time. Second, the three flight stewardesses who were with us at different times during the journey would, I consider, have gained first, second and third prizes in any properly conducted international beauty contest!

But to turn to less personal recollections. It seems to me that the advances made during the past twenty-five years have been truly remarkable, both as regards flying comfort generally and conditions for the comfort of passengers on the ground. It struck me as a pity that, with the possible exception of Beirut, London Airport was the least attractive, both to see and to use, of any we visited. Karachi Airport and the most excellent accommodation at Speedbird House are indeed a contrast.

*Sir Samuel Hoare (now Lord Templewood) and Lady Maud Hoare at the start of the inaugural flight on March 30th, 1929. Their pilots were Capt. A. S. Wilcockson and Maj. H. G. Brackley.*

I was reminded of the great changes which have taken place when I discovered that none of the many members of the aircrews to whom I spoke had ever heard of Lingeh—one of the airports we used in 1929.

I hope, in 25 years' time, to make the journey again. What do I expect to find? Well, at the present rate of progress it should take about eight minutes, with a free supply of nectar and the ministrations of a selection of the world's lovelies thrown in for good measure . . .

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## VALUE OF THE V-BOMBER

IN a recent talk to the Handley Page Engineering Society, G/C. R. C. M. Collard, the company's sales manager, spoke of the Government's decision to concentrate on the building-up of the nation's strategic bombing power. He said: "With the most expert advice and information at their disposal, the Government have decided that the proper weapon of war today is the strategic bomber. That decision represents a great triumph for the Air Staff and a great tribute to the common sense of the people who are running affairs."

Earlier, he had told his audience: "I don't think anyone doubts now that bombing is worth while." He went on: "The only point of having any weapons today is to prevent a war. It is not much good having a lot of men or ships or aircraft which will be used when the war commences, for the idea is *not to have* a war.

"The Government suggest that the proper way is to have a deterrent arm. Bombing can be done without warning. It is the only effective way of attacking the enemy at once."

G/C. Collard added that to people who asked why England, and not America or some other country, should have the strategic bombing force, the answer was: "Do you want to go on being a sovereign country or not? If you do, you cannot manage without this weapon. And if you agree that you cannot do without this weapon, then not only must the people who fly it be first-class—the best you can find—but the aeroplanes themselves, when you consider what they mean, must be the best possible."

He concluded: "It does seem to me, that anyone nowadays who is connected with the manufacture of strategic bombers for this country is doing as much as can be reasonably asked to preserve the peace of the world."

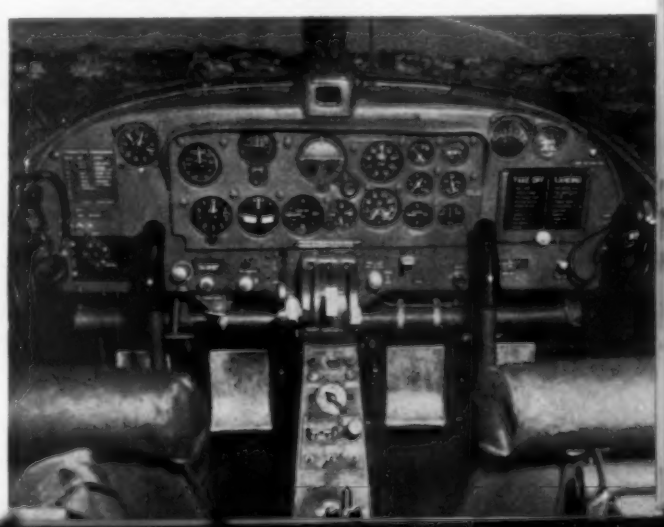
G/C. Collard, who, until he joined Handley Page, Ltd., last year was Group Captain (Operations), Coastal Command, was speaking on *Reminiscences of a Bomber Pilot*. In subsequent conversation he made the point that the pilot of a V-bomber in some ways carried a load of responsibility equivalent to that of the commander of an army group. He had in his hands a large slice of the taxpayers' money, and had no one to turn to for a decision. Losing a modern bomber was almost comparable with losing a warship. Apart from the cost involved, an aircraft of this kind was virtually irreplaceable in terms of the productive capacity needed to build it.

## THROTTLE BENDERS FOREGATHER

THE Throttle Benders' Union held their annual dinner at Ciro's Club, London, on March 20th. It was a completely informal gathering, at which the guests were a number of Royal Aero Club officials, and others connected with air racing.

Membership of the T.B.U. is strictly limited to pilots who have won a major air race. The only new member for the last year was Walter Bowles, who qualified by winning the Norton Griffiths race. The other members are: J. N. Somers, C. G. Alington, F. Dunkerley, A. L. Cole, R. R. Paine, J. Rush and an honorary member, G. Ferrari of Italy. Their racing careers are the subject of a series of articles, by H. J. Cooper, appearing periodically in *Flight*.

*GETTING THEIR HEADS TOGETHER: The cockpit layout of the Ryan model 72 (Navion trainer)—one of the first American side-by-side basic trainers—recently submitted to the U.S. Navy for evaluation. Only the throttle and flying controls are duplicated, both pilots having to read and rely on one centrally mounted set of instruments. The dial at upper left is a g-meter with L.F. navigation control panel below. Take-off and landing check-lists are clearly displayed on the right.*



"Flight" photograph

*ON THE DECK: Low-level, low-speed tractability is demonstrated by one of the latest-type Sea Venom F.A.W. 21s, with clear-vision hood and modified tail, now coming off de Havilland's production line at Chester. This fly-past was made with flaps up at 150 knots.*

# SERVICE AVIATION

*Royal Air Force and Fleet Air Arm News*

## New Fifth Sea Lord

THE Queen has been graciously pleased to approve the appointment of Rear-Admiral A. N. C. Bingley, O.B.E., to be a Lord Commissioner of the Admiralty, Fifth Sea Lord and Deputy Chief of Naval Staff (Air), in succession to Vice-Admiral Sir Edmund W. Anstice, K.C.B. The appointment is with effect from June next.

Admiral Bingley has had a long association with naval/air operations. During the war he commanded the escort carriers H.M.S. *Slinger* and *Biter*, and in 1944, in the rank of captain, took over command of a mobile air base.

For the three years from December 1945 to 1948 he was Deputy Director of Air Warfare at the Admiralty and then took a course at the Imperial Defence College. His next appointment was as Chief of Staff to Flag Officer (Air) at Lee-on-Solent and, in November 1952, became commanding officer of H.M.S. *Eagle*. He remainder in command of this carrier until last December.

Admiral Bingley was given flag rank in January. His O.B.E. was gazetted in the Birthday Honours list of 1942, for service while on the staff of the Commander-in-Chief Home Fleet.

## More Sabre Fives for R.C.A.F.

LAST week-end a further 28 Canadair-built Avro Canada Orenda-engined Sabre Mk 5 fighters were at Goose Bay, Labrador, in preparation for crossing the Atlantic. They were scheduled to fly *via* Greenland and Iceland to Kinloss, the Coastal Command station in Scotland, whence they are assigned to Royal Canadian Air Force bases in Britain, France and Germany.

## R.N.V.R. in Royal Fly-past

FURTHER details are announced of the part to be played by the Air Divisions in the 50th Anniversary Review of the R.N.V.R. before the Queen on June 12th.

From each of the 12 squadrons comprising the five air divisions there will be eight aircraft, and the whole formation will be led by Cdr. R. I. Gilchrist, M.B.E., R.N.V.R., who commands the Northern Air Division, based at Stretton, near Warrington, Lancashire.

This will be the first time that the air divisions have flown together in this manner, but it will be remembered that they combined with regular squadrons of the Royal Navy for the mass fly-past over the Fleet at Spithead after the Coronation Naval Review.

## Triple Tie in Championship

ALTHOUGH only needing to draw with the Army at Twickenham last Saturday to become the Service champions for the first time for seven years, the R.A.F. XV failed badly, losing by 16 points to 3 points.

The Army found a new strength in their forward line and in the loose had things very much their own way. There was little doubt that the R.A.F. were missing Rowlands, Channer and Barter, who played so well in the victorious match against the Navy.

Loss of this match by the R.A.F. means that the Services tournament ends in a triple tie, as happened in 1924, 1935 and 1948.

The teams were:

ARMY.—Capt. A. B. Edwards (R.A.E.C.), 2nd/Lt. J. S. Swan (R.E.M.E.), L/Cpl. P. Jackson (R. Sigs.), L/Cpl. W. J. Boston (R. Sigs.), Off. Cdt. R. C. Bazley (R.E.), Sigmn. B. Gabbitas (R. Sigs.), Sigmn. R. Evans (R. Sigs.), Pte. D. Watchorne (R.A.M.C.), Lt. F. R. Beringer (R.E.) (captain), Tpr. H. F. McLeod (Greys), Cfn. J. H. Hancock (R.E.M.E.), 2nd/Lt. R. W. D. Marques (R.E.), L/Cpl. A. R. McCrae (R. Sigs.), Off. Cdt. R. M. Turner (R.W.K.), L/Cpl. R. Higgins (R. Sigs.).

ROYAL AIR FORCE.—S/L. A. A. Smailes (Air Ministry), Off. Cdt. D. J. McPherson (Kirton-in-Lindsey), A.C. B. Jones (Innsworth), S. A/C. D. T. Williams (Merrifield), F/O. J. Boothman (Halton), F/L. T. R. Beatson (Wroughton), S/L. A. W. Black (Merrifield), F/L. R. V. Stirling (Air Ministry) (captain), Off. Cdt. M. U. Hughes (Jurby), P/O. C. David (Yatesbury), F/L. P. G. Yarranton (Air Ministry), L.A/C. J. Sewell (Catterick), F/O. D. G. Naylor (Netheravon), F/O. G. J. A. Head (Halton), P/O. J. C. Collard (Locking).

## Polar Flights

YESTERDAY, four teams made up of staff and students from No. 12 Specialist Navigation Course at the R.A.F. Flying College, Manby, were due to set out in two Hastings aircraft for training flights including two sorties over the geographical North Pole. The detachment is being led by S/L. H. D. Archer, D.F.C., with S/L. R. H. Fry, D.F.C., in charge of the navigational side.

The object of the flights is to gain experience of long-range navigation, using grids and other techniques and also to exchange information with the R.C.A.F. Special Navigation Course at Summerside on Price Edward Island. It will be remembered that four Lancasters from the Canadian "Spec N" course at Summerside recently came to R.A.F. Shawbury and later visited the R.A.F. Flying College.

## Australian S.A.S.O. for No. 3 Group

THE appointment is announced of A. Cdre. C. D. Candy, O.B.E., Royal Australian Air Force, to be Senior Air Staff Officer No. 3 Group, Bomber Command.

A. Cdre. Candy served with Coastal Command at the early part of the war and from 1944 to 1945 was S.A.S.O. R.A.A.F. Command, A.A.F., S.W.P.A. In 1947 he took the Joint Services Staff College course and last year attended the Imperial Defence College.

## F.C.U. Efficiency Trophy Winners

AWARDED annually to Auxiliary Control and Reporting Units of Nos. 11 and 12 Group for all-round efficiency, the two trophies have, for 1953, been awarded to No. 3700 (County of London) Raid Reporting Unit (W/C. E. Fennessy, O.B.E.) and No. 3508 (County of Northumberland) Fighter Control Unit (W/C. E. B. R. Lockwood, D.S.O., M.B.E.). Runners-up were No. 3500 (County of Kent) Fighter Control Unit (S/L. J. L. Sole, M.B.E.) and No. 3603 (City of Edinburgh) Fighter Control Unit (W/C. M. G. Pearson). Air Marshal Sir Dermot A. Boyle, A.O.C-in-C. Fighter Command, sent congratulatory messages to the successful units. A.V-M. H. L. Patch, A.O.C. No. 11 Group, was due to present No. 3700 R.R.U. with their trophy at their town headquarters at Hallam Street, London, W.1, last Tuesday.

## R.A.F. Appointments

THE following are among recent appointments announced by the Air Ministry: G/C. J. D. Ronald, A.F.C., is now S.A.S.O. at No. 22 Group and G/C. A. V. Bax, C.B.E., A.F.M., is with No. 62 Group as Senior Officer Administration. G/C. A. A. Saw has gone to the department of the Air Member for Supply and Organization.

In command, G/C. G. T. B. Clayton, D.F.C., is at Cottesmore; G/C. K. J. Mellor, D.S.O., D.F.C., at Celle; G/C. C. E. S. Lockett at Leconfield; G/C. C. R. D. L. Lloyd at West Kirby; G/C. L. Fox, D.S.O., D.F.C., at Colerne; G/C. J. C. Larking, D.F.C., at Merryfield;

## SERVICE AVIATION...

G/C. J. A. N. Louden at Uxbridge; W/C. D. C. Sandeman, D.F.C., at No. 33 M.U.; W/C. G. P. Harger, O.B.E., D.F.C., at Spitalgate and S/L. H. L. Pugh at No. 8 M.U.

For staff duties G/C. R. E. Burns, D.F.C., has gone to the British Joint Staff Mission in Washington and W/C. T. P. Seymour to Air H.Q. Eastern Atlantic; G/C. R. S. Ryan, C.B.E., is now Air Attaché in Stockholm.

Air Staff appointments include those of G/C. R. I. K. Edwards, D.F.C., A.F.C., to Air H.Q. Aden; G/C. J. N. Baxter to No. 21 Group; G/C. J. B. Tait, D.S.O., D.F.C., to H.Q. M.E.A.F.; G/C. L. E. Giles to H.Q. Bomber Command; G/C. C. C. Morton, C.B.E., to No. 90 Group; and W/C. W. A. L. Davies, D.F.C., A.F.C., to No. 25 Group. Each with the acting rank of wing commander, S/L. H. H. Wood-Glover, M.B.E., has gone to H.Q. No. 2 Group and S/L. H. E. Hunt, M.B.E., to H.Q. AAFCE.

In the Air Ministry G/C. F. W. Judge and W/C. F. H. Kelly, M.B.E., are now in the department of the Air Member for Supply and Organization and W/Cs. W. N. Kenyon, D. C. Smythe and S. P. Coulson, D.S.O., D.F.C., are all in the department of the Chief of the Air Staff.

Appointments made to the Ministry of Supply include those of G/C. H. E. Dicken, O.B.E., and W/Cs. I. Roberts, A. E. Hewes and J. B. Russell, D.S.O.

For administrative duties, G/C. E. J. P. Davy has gone to Air H.Q. Malta (as Sen. Officer Admin.); G/C. H. W. Mermagen, C.B.E., A.F.C., to H.Q. Flying Training Command; G/C. R. F. Fleming to Halton; W/C. E. H. Lynch-Blosse, O.B.E., to H.Q. F.E.A.F.; W/C. H. J. Hobbs to Benson; W/C. K. C. Roberts, A.F.C., to Hendon; W/C. A. M. K. Phillips to Worksop; W/C. J. K. Silver to H.Q. Flying Training Command; W/C. G. D. Sise, D.S.O., D.F.C., to Waterbeach; W/C. J. W. Allan, D.S.O., D.F.C., to H.Q. Fighter Command and S/L. G. W. Price to No. 4 School of Technical Training (with acting rank of wing commander).

Technical appointments include those of G/C. D. S. Kite to H.Q. Bomber Command; W/C. R. D. Hill to H.Q. Coastal Command; W/C. C. V. Stammers, O.B.E., to H.Q. 2nd T.A.F.; W/C. A. B. Kendall, O.B.E., to Topcliffe; W/C. L. P. Gibson to No. 107 M.U.; W/C. A. J. Handley to No. 2 School of Technical Training and W/C. H. F. Davis to South Cerney.

W/C. M. D. Lyne, A.F.C., is now on the directing staff of the R.A.F. Flying College at Manby, while W/C. R. E. Craven is at St. Eval and W/C. D. H. Thomas, D.S.O., D.F.M., at Lindholme, both for flying duties.

### Reunions

THE annual dinner of the Glasgow University Air Squadron will take place on Friday, April 23rd, in the Rhul Restaurant, 123 Sauchiehall Street, Glasgow. Tickets, 25s, from the Adjutant, G.U.A.S., 11 Bute Gardens, Glasgow, W.2.

The 32nd all-ranks reunion of No. 269 Squadron and R.N. Seaplane Bases Port Said and Alexandria will be held at Stewart's Restaurant, Old Bond Street, London, W.1, on May 1st at 6 p.m. Tickets (15s) from W. C. Shilling, Selgrove, Kewferry Drive, Northwood, Middx.

## THE R.C.A.F. IS THIRTY

THE Royal Canadian Air Force celebrated its 30th birthday yesterday and the occasion was marked in Britain by a dinner at the R.A.F. Club.

The true beginnings of the R.C.A.F. go back as far as September 16th, 1914, when the formation of the Canadian Aviation Corps was authorized with an establishment of two officers and an expenditure of not more than 5,000 dollars to purchase a Burgess-Dunne biplane.

A little earlier that year, Col. Hughes, then Minister of Militia and Defence, cabled Lord Kitchener, Secretary of State for War, asking if the "services of aviators" were required. The War Office replied that six expert aviators could be taken at once—"and perhaps more later."

Recruiting for the Royal Flying Corps and Royal Naval Air Service started in the spring of 1915, and it is interesting to note that aircrew were expected to secure their pilots' certificates *at their own expense* before being commissioned.

Many famous Canadians served with the British air forces; men such as Capt. W. A. Bishop, the first Canadian air V.C., won while serving with No. 60 Squadron, R.F.C., he had 72 air victories to his credit; 2nd Lt. A. A. McLeod, while serving with No. 2 Squadron R.F.C., was also awarded the Victoria Cross, and so was Major W. G. Barker, whose total victories numbered 50.

By the time the armistice came 22,000 Canadians had served in the R.F.C., R.N.A.S., and R.A.F. Of these 1,563 gave their lives and 800 were decorated.

In August 1918 a Canadian Air Force detachment was formed at Halton to train mechanics for two proposed all-Canadian squadrons in the R.A.F., and in November of the same year Nos. 81 and 123 Squadrons R.A.F. at Upper Heyford became Nos. 1 and 2 Squadrons C.A.F. and formed No. 1 Canadian Wing, C.A.F. These units were, however, disbanded in 1920 and the C.A.F. re-authorized only as a non-permanent, non-professional force. Former officers and airmen were invited to serve for not more than five weeks every other year!

For the next four years there were various attempts at re-organization, but on April 1st, 1934, the R.C.A.F. finally came into being with an establishment strength of 68 officers and 307 airmen. When war broke out once more in 1939 the total strength of the R.C.A.F., both permanent and auxiliary, was 410 officers and 3,651 airmen. Of its 270 aircraft 19 were Hurricanes, 22 Wapitis, 20 Oxfords, 13 Atlases, 12 Northrop Deltas, 11 Sharks, 10 Battles, 8 Stranraers, 5 Siskins, 4 Norsemen and 4 Vancouvers.

Peak expansion came in 1943 when there were 78 squadrons—35 overseas, 37 at home and 6 in course of transfer.

No. 1 Squadron, R.C.A.F., later renumbered No. 401 Squadron to avoid confusion with the R.A.F., was based at Northolt for the Battle of Britain and in 53 days fighting before being withdrawn for a rest, it was credited with destroying 30 enemy aircraft and damaging 43 others. But the Canadian squadrons were not all fighter units, they served in every Command and theatre.

*A.V-M. C. R. Slemon, who is the present C.A.S. of the R.C.A.F.*

Short of writing a book it would be impossible to give even the briefest account of the distinction with which the Canadians served. Names which come to mind are F/L. Hornell and P/O. Mynarski who both won the V.C., and A. Cdre. Ross, F/O. Gray and L.A/C.s Gravell and Spooner, who were all awarded the George Cross. Of the 133 aircrew manning the 19 Lancasters of No. 617 Squadron, R.A.F., that breached the Möhne and Eder dams, 29 were members of the R.C.A.F. and the R.C.A.F. also contributed 74 aircraft to the force of 597 which made the attack on the German research and development station at Peenemunde on the Baltic coast. It was this raid which delayed for a critical period the production of the V-1 flying bomb.

In both wars, in addition to providing operational units, the Canadians operated flying training schemes. That of the 1939-45 war was known as the British Commonwealth Air Training Plan. Between April 1940, when training began, and March 1945, when it terminated, 131,553 aircrew were trained at approximately 360 schools.

Today, under NATO, the Royal Canadian Air Force is operating in Europe four wings of Canadair-built Sabres, comprising 12 squadrons.

*HONOURABLE RETIREMENT: As we reported a fortnight ago, the R.C.A.F. has recently pensioned off its last four Avro Ansons, seen here in formation. Three will be scrapped, but the fourth will join a Lysander, Hurricane, Mosquito, Tiger Moth and Battle in the R.C.A.F. historic-aircraft hangar at Chater, Manitoba.*

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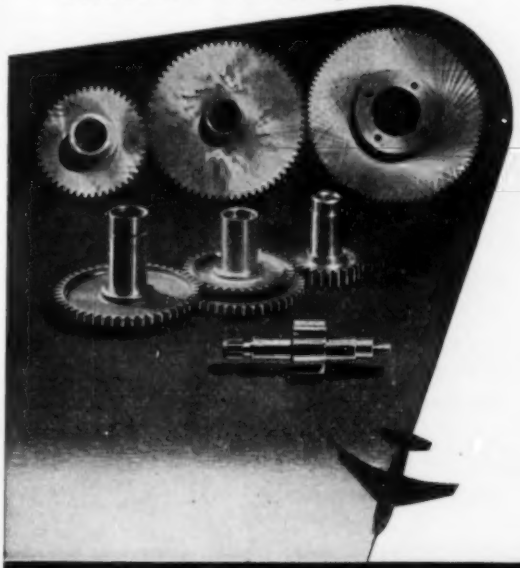

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LEWIS—EDLINGTON. On March 13th, 1954, at Christ Church, Park Avenue, New York, Ernest Henry William Lewis, of B.O.A.C., Montevideo, son of Mr. Ernest Robert Lewis, of Torquay, and the late Mrs. Rose Lewis, to Virginia May Edlington, only daughter of Mr. and Mrs. Arthur Vincent Edlington, of New York City. [1832

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SCIENTIFIC officer, Grade 3, £1,154/£1,262 per annum—temporary position.

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EXPERIMENTAL officer, Grade 3, £1,154/£1,262 per annum—temporary position.

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Department of Supply,
Australia House,
The Strand,
London W.C.2.

By 22.4.54 [1851

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### COMMONWEALTH OF AUSTRALIA

**Department of Supply**

**AERONAUTICAL RESEARCH LABORATORIES, FISHERMEN'S BEND**

**Senior Scientific Officer**
(temporary position)

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THE salaries quoted are Australian currency.

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FURTHER information and application forms obtainable from:

SENIOR REPRESENTATIVE (A.P.12),
Department of Supply,
Australia House,
The Strand,
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to direct work on the application of solid fuel propellants including the development and proving of solid fuel motors, promotion of basic study and analysis of performance. Degree and experience of design desirable. Ref. No. 1185

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for structural analysis and structural testing. Qualification, degree or H.N.C. Previous experience of this work not essential.

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Qualification: degree or equivalent standard. Some experience in aeronautical engineering desirable.

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(Senior and Junior)

Preferably with aircraft experience, but men with mechanical, structural or electrical experience also considered. Requirements are mainly for airframe design, but certain vacancies exist for work on wind tunnel models and equipment, and on aircraft instrumentation.

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Preferably with aircraft experience.

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For designing machine fixtures, assembly tools and jigs.

Write, giving full particulars, including age and salary required, to Personnel Department, Hursley Park, near Winchester, Hants. [1801

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[1849

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AIRCRAFT company in greater London area invites applications for superannuated position as head of technical publications section of design department. It will be essential that the successful applicant has the experience of complex aircraft or light engineering technical illustration and/or authorship, together with the enthusiasm to deal with work and problems urgently and the personal qualities necessary to lead a section of about 15 writers and artists. Knowledge of printing methods is also required and familiarity with Ministry of Supply procedure an advantage.—Detailed applications clearly stating full experience to: Box 4478 [1850

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Good salaries and excellent prospects for men with ideas. Pension scheme, housing assistance.

Applications, with details of age, qualifications and experience, to the Staff Appointments Officer, Short Brothers & Harland, Limited, Belfast, before April 13th, 1954. [1822

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Several vacancies exist on the staff of a rapidly expanding precision instrument manufacturing firm in connection with long-term design and development work.

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WRITE, stating age and full details, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [1855

D. NAPIER AND SON, Ltd., The Airport, Luton, Beds, have the following senior vacancies:

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DRAUGHTSMEN required for interesting work on Aircraft and Vehicle Remote Controls.

APPLY in writing in the first instance to Teleflex Products, Ltd., High Road, Chadwell Heath, Essex. [1819

THE flight development establishment of D. Napier and Son, Ltd., at Luton, have the following vacancies:

SENIOR technical assistant to at least Higher National Certificate standard who has had extensive experience in the flight testing and performance evaluation of high-speed jet engine aircraft. Ref. No. 1270.

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ONE technical assistant of approximately Ordinary National Certificate standard with some experience of flight test work. Ref. No. 1272.

WRITE, quoting appropriate reference number, to Dept. C.P.S., 336-7 Strand, W.C.2. [1785

THE DE HAVILLAND ENGINE CO., LTD., have the following technical vacancies available in their Gas Dynamics Laboratory, Hatfield:—

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